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COMPUTE!'s GAZETTE

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May 1985
Issue 23, Vol. 3, No. 5
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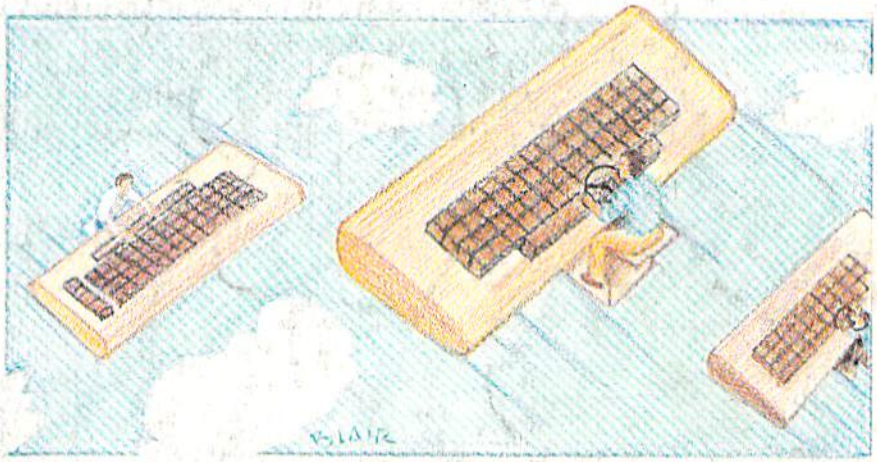

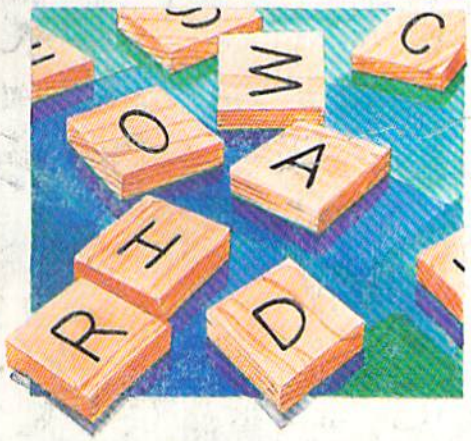

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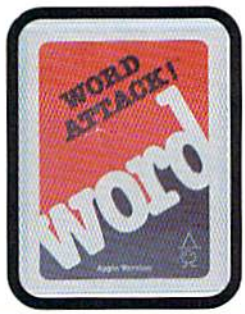

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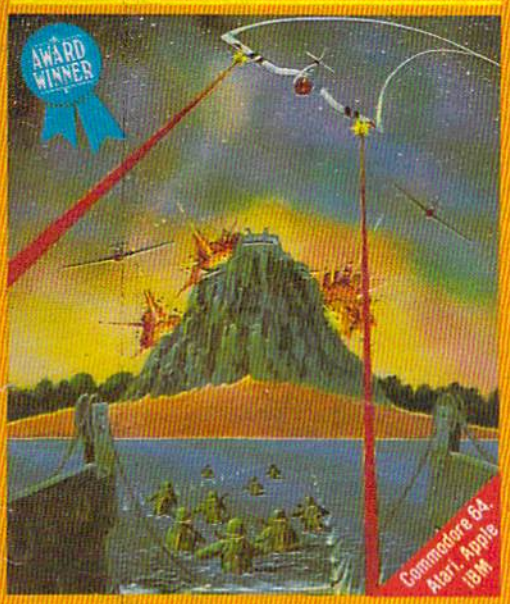

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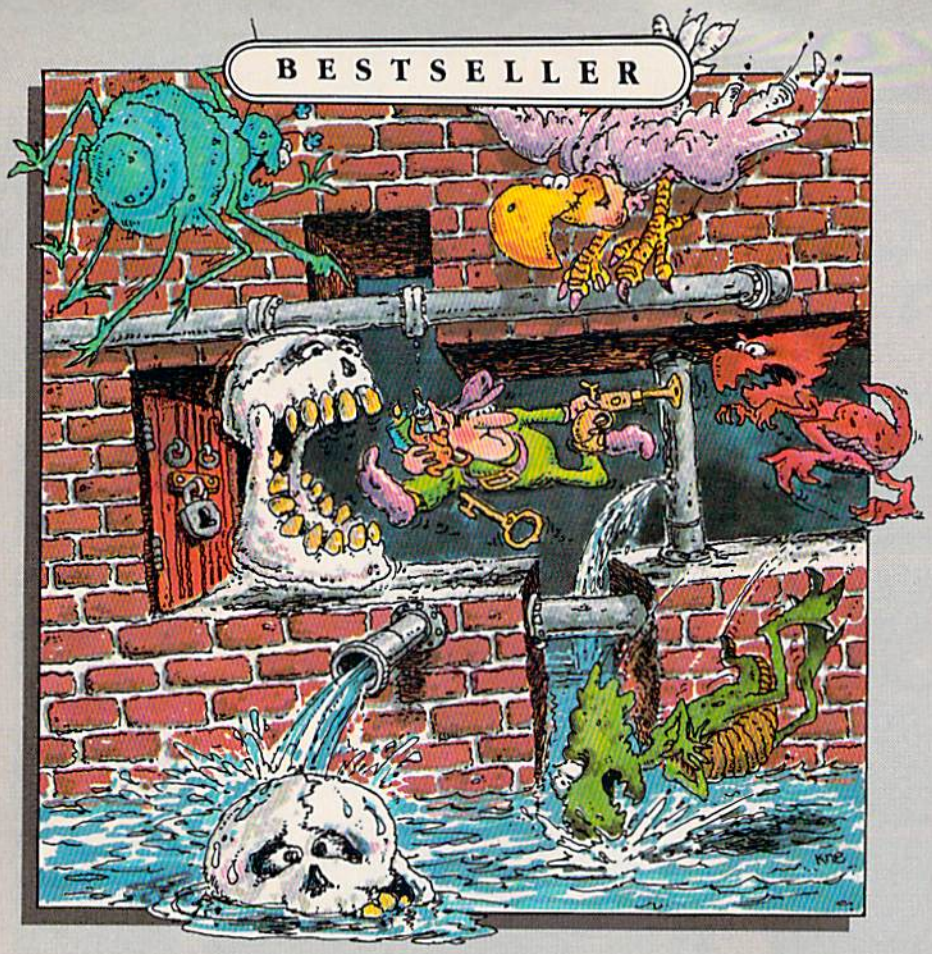

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* =General, **V**=VIC-20, **64**=Commodore 64, **+4**=Plus/4, **16**=Commodore 16.

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THE EDITOR'S *notes*

It seems that recently a few readers have taken us to task for printing our popular word processing program in our magazine COMPUTE!. We'd like to address this issue to help clear the air for this and future publication questions.

Our general policy has been never to publish the same material in COMPUTE! and the GAZETTE. Our willingness to make an exception to this policy has been in those cases where we feel we are able to deliver software of such importance to our readers that we think the duplication is justified. Such is the case with "TurboTape" and "TurboDisk," two articles and programs that will be appearing in the July issue of the GAZETTE. These are breakthrough-quality programs. They appeared first in COMPUTE!, but are of such importance that we feel they should also be presented in the GAZETTE. *SpeedScript*, a word processing program developed and enhanced here, was originally presented in the pages of the January 1984 GAZETTE. An enhanced version of it was presented on the May 1984 GAZETTE DISK as, among other things, a bonus for those purchasing the first DISK issue.

Another version of *SpeedScript* has been in the works for additional machines. This enhanced *Speedscript 3.0*, is written for the Apple and Atari computers as well as for the Commodore computers. We enhanced it for COMPUTE!; we developed additional versions for the COMPUTE! market. Some of those who wrote took the position that *SpeedScript* "belongs" to the GAZETTE. We disagree. As publishers, we have a right and obligation to present all of our respective audiences with a valuable product—chosen for its utility and appeal. The GAZETTE cannot maintain or continue to provide 20 or 30 percent of its editorial space for *SpeedScript* listings; COMPUTE! cannot either. We do think it fair to provide original listings, enhancements, etc. of major products as they are developed. This we have done in both of our magazines.

Each of our publications has large Commodore constituencies. Each has large and nonoverlapping circulation groups. COMPUTE!, our flagship publication, has covered the Commodore market since its first issue in the Fall of 1979. COMPUTE! has published many breakthroughs over the years and will, of course, continue to do so. The GAZETTE will continue to enjoy its share of Commodore events, but it will not publish them all. Our two different magazines do in fact share some audience characteristics, so it is inevitable that there will be some overlap of purpose.

As publishers, we must maintain two useful, functional, dynamic publications that serve their respective readerships. We feel that we do that well; we plan to continue to do so. As readers, you must expect that COMPUTE!, the parent of GAZETTE, will continue to print its fair share of major Commodore information. Our premise in the past, and one we maintain, is that COMPUTE! is a more technically advanced publication than GAZETTE. Naturally, there will be times and areas where there is a readership overlap. We try to minimize them; we cannot totally escape them.

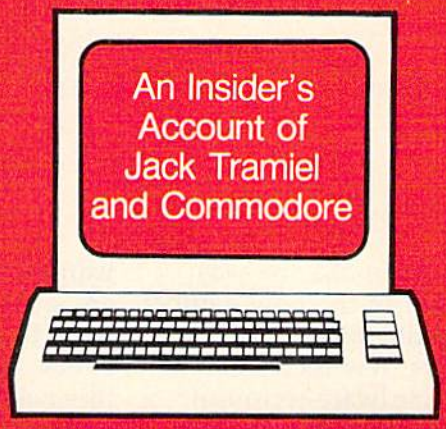
We do not see the two magazines as mutually exclusive publications and will continue to provide you with a premium editorial product in both. Overlap, as always, will be held to a minimum.

We should also address, more specifically, the question of audience. What kind of person reads COMPUTE! books and magazines?

Over the years, the audience has changed. When first started in 1979, COMPUTE! was read by a small and often strongly partisan group of enthusiasts. The magazine attempted then to serve the needs of a few thousand minds.

The majority--then as now—owned self-contained, complete computers like the Commodore PET, Atari, and Apple, but there were also owners of the "computer-on-a-board" AIM computer, manufactured by Rockwell. A

THE HOME COMPUTER WARS



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section of the magazine was also devoted to the now defunct Ohio Scientific line.

The first few issues had a distinctly hardware-technical texture, reflecting the interests of some of the hackers and scientists who were the first to assemble their own machines. "Retrofitting ROMs" and "Microprocessors for Nuclear Instrumentation" are examples of articles which appealed to a far larger percentage of the readership in the early days.

Reviews covered generally the same territory as they do today: word processors like *WordPro*, languages like Logo, and a hard disk drive, the Corvus IIA, with 9.6 megabytes for $5,300 which works out to be 1,811 bytes per dollar. (Current hard disk memory prices range between 10,000 and 20,000 bytes per dollar.)

But perhaps most revealing are the ads. Many of them were for hardware add-ons for the do-it-yourself home engineer: motherboards; EPROM firmware; a computer-on-a-board kit with BASIC built in and 4K RAM for $550; keyboard kits. Then, too, the prices were much higher. The then new 32K RAM Commodore PET went for $1,300; the 48K Apple II Plus for $1,500.

As computers became more commonplace and easier to operate, an entirely new audience began to arise: the recreational computerist, someone who wanted to learn about computers and programming, but didn't want to actually build the machines. In the past several years, this has become the majority audience for COMPUTE! Publications.

Most of our readers are interested in the impact of computers on society and want to be intelligently informed about the uses of these new machines and the way they work. In some senses, this means software: how do people communicate with computers, what products are available to make computers more useful, what software from COMPUTE!'s books and magazines will be a valuable addition to the reader's program library?

Although we receive hundreds of letters from readers each week, we read every one. Some readers, particularly young people and parents, express interest in our game programs and educational software. Many others enjoy learning more about programming and value utilities such as "TurboTape" and "TurboDisk," which greatly improve access speed to mass memory. Other popular programs include BASIC enhancement packages, sound and graphics tutorials, and general-interest features like weather forecasting and, of course, the *SpeedScript* word processor.

Over the years, we editors at COMPUTE! Publications have read many thousands of letters ranging from severe criticism to unqualified praise. Most letters, of course, contain a little of both. In addition, each month many readers fill out our Editor's Feedback cards and those, too, are carefully studied.

No publisher serving the needs of more than a million minds a month can hope to satisfy them all in every way. But that is our goal and our constant effort.

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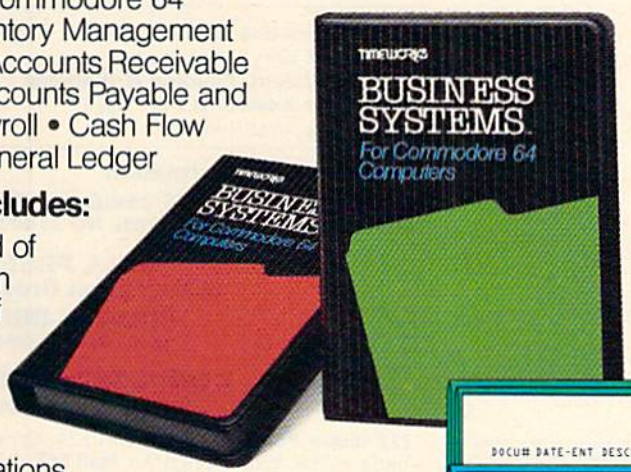

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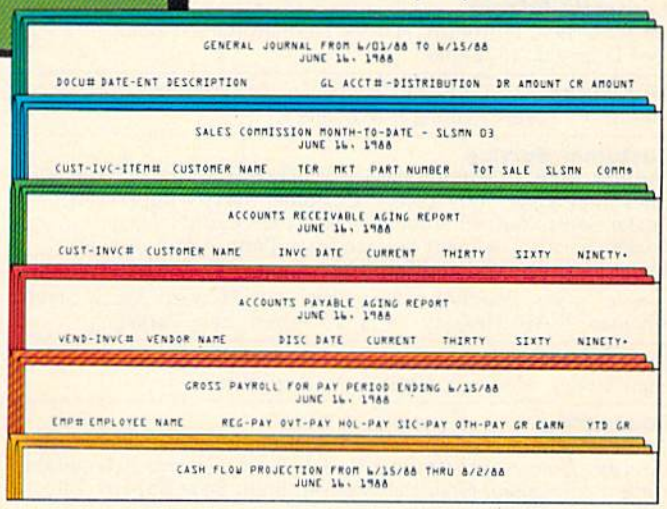
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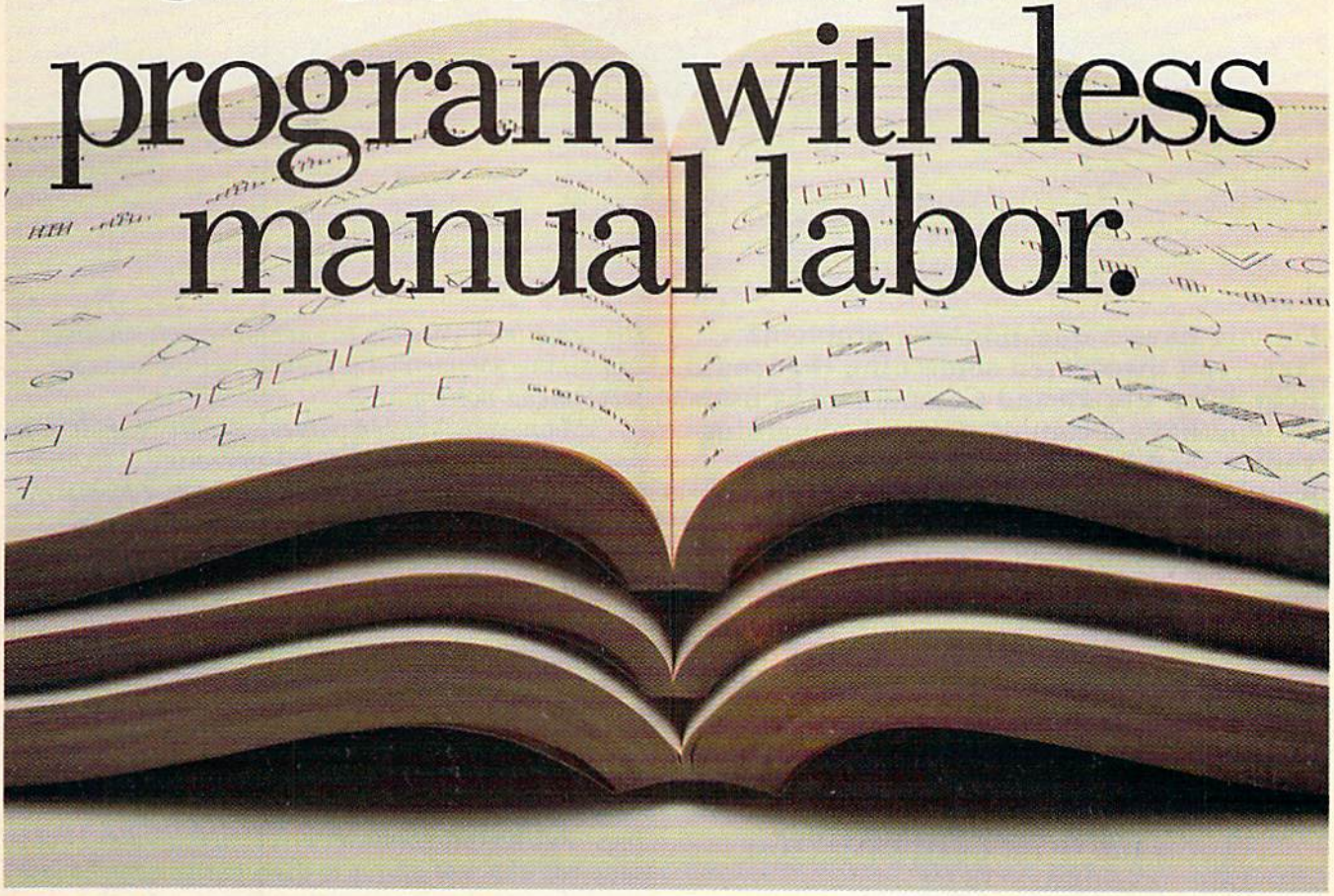

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GAZETTE FEEDBACK

Editors And Readers

Do you have a question or a problem? Have you discovered something that could help other VIC-20 and Commodore 64 users? Do you have a comment about something you've read in COMPUTE!'s GAZETTE? We want to hear from you. Write to Gazette Feedback, COMPUTE!'s GAZETTE, P.O. Box 5406, Greensboro, NC 27403.

Easy Scratch And SAVE

Since I don't usually have time to type in an entire program in one sitting, I start all my programs with these lines:

```
1 GOTO10:REM *** PROGRAM NAME FROM
  PAGE XXX OF GAZETTE ***
2 OPEN15,8,15,"S0:programname":
  CLOSE15:SAVE"programname",8:END
10 (first line of program)
```

When I have to stop, I type RUN2. The older version is scratched from disk and the latest version is then saved. To run the program, just type RUN.

Diane Sheairs

A lot of programmers use this trick to save a little typing time. It's even simpler to do with tape, because you can change line 2 to **2 SAVE "program name"**. *You don't have to scratch the old program before saving. Thanks for sharing this with us.*

Asking For Trouble

I have several commercial programs on disk. Most are no more than 100 blocks long. What I would like to do is mark the (copy-protected) error tracks as allocated, so I can use the remaining 500+ blocks for my own programs. I tried the Block-Allocate command, but it didn't seem to work.

James E. Shaw

It's sometimes possible to save programs on disks containing commercial software, but we strongly recommend not trying it.

Many software companies, as part of their copy protection, have a unique disk operating system (DOS) which stores disk information in a format that's incompatible with the normal 1541 DOS. Even if you allocated the error tracks, you couldn't use the disk for your own programs.

Other commercial disks may contain "signatures," or code words, in seemingly blank disk sectors. When the program is first run, it checks for both the error tracks and the hidden signature. If you happened to save a program to the coded sector, the commercial program would not run.

The potential loss outweighs the potential savings. Putting programs on a commercial disk could save you the cost of a new disk, but you might lose the software that cost you ten times as much.

TV Interference

I'm not able to load any programs with the TV on. When it's off, they load perfectly without any problems. Can you explain what's going on or how I can fix this?

Stephen D. White

You didn't indicate whether you're using tape or disk, so we'll guess you have a Datassette, which is more sensitive to magnetic interference.

Picture the process of loading from tape. A magnetic pattern on the tape is read by the cassette player, sent through the cable, and put into the computer's memory.

The magnetism generated by your TV is scrambling the program as it is read from the tape. The answer? Move your cassette drive and cable as far from the television as possible. If this doesn't work, try shielding the cable.

The same advice applies to owners of disk drives. If the television is too close to the drive, it can interfere with disk access.

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POKE Control

I have amassed some POKEs for the 64 *(Editor's Note: We've added the equivalents for the VIC, Plus/4, and 16):*

	64	VIC	Plus/4,16
Disable LIST	775,191	775,223	774,187
Enable	775,167	775,199	774,110
Disable SAVE	819,246	818,73	816,136
Enable	819,245	818,133	816,164
Disable LOAD	816,157	816,103	814,239
Enable	816,165	816,73	814,74
Disable RUN/STOP	808,239	808,100	806,103
Enable	808,237	808,112	806,101
Disable RESTORE	792,193	792,7	---
Enable	792,71	792,173	---
Disable keyboard	649,0	649,0	1343,0
Enable	649,10	649,10	1343,10
No keys repeat	650,64	650,64	1344,64
All keys repeat	650,128	650,128	1344,128
Enable repeating keys (space, delete, and cursor keys)	650,0	650,0	1344,0
Clear keyboard buffer (before INPUT)	198,0	198,0	239,0
Cursor speed, x is 0 (fastest) to 255	56325,x	37159,x	---
Change character color, x is 0–7 for VIC, 0–15 for others	646,x	646,x	1339,x
Remove line numbers during LIST	22,35	22,35	22,35
Enable	22,25	22,25	22,25

Blaine White

Thanks for the information.

Readers should note that if you disable the keyboard in direct mode, you won't be able to enter the POKEs to get it back because, of course, the keyboard is disabled. RUN/STOP–RESTORE still works, unless you've disabled it too, and will make the keyboard work again. Also, strange things happen when you POKE22,35 to stop the printing of line numbers. For one thing, printing a string inside quotes (PRINT "ABC") won't work, although string variables *can still be printed. Other POKEs may have unexpected side effects—for example, changing the cursor speed makes the jiffy clock unreliable.*

Here's one more useful series of POKEs. If you accidentally type NEW and want to get the program back, enter this line in immediate mode:

For the 64: **POKE2050,1:SYS42291:POKE45,PEEK(34):POKE46,PEEK(35):CLR**

For the VIC: **POKE4098,1:SYS50483:POKE45,PEEK(34):POKE46,PEEK(35):CLR**

VIC owners with 8K or more expansion should change the first POKE to POKE4610,1. This short UNNEW program can be helpful.

A Bug In String Values?

I'm having a problem with the VAL and STR$ commands in BASIC. If a string is converted to a value and then back to a string, an extra space is somehow added to it. For example, A$="99": A=VAL(A$):A$=STR$(A):PRINTLEN(A$) returns a length of three instead of two. A$ has become (space)99. Is my computer defective, or is there a glitch in Commodore BASIC?

Scott W. Whittlesey

No and no. As some programmers might say, "That's not a bug, that's a feature."

The reason for this feature is that numbers can be positive or negative. STR$(−99) turns out to be "−99" with a minus sign in front, but no extra space. To be consistent, positive numbers are prefaced by a space which, in a way, signals that the number is positive.

If you want to eliminate the space, use this line: A$=MID$(STR$(A),2). If the variable A happens to be negative, the minus sign will be stripped off.

For more on the subject, see Michael Tomczyk's column "BASIC Magic" elsewhere in this issue.

A Play-It-Once Game

I recently noticed an ad for a game about dungeons. But someone told me it was only useable once! I would like to know if this is true.

Tim M. Adamec

If it's about dungeons, it's probably an adventure game, which is like a computer story where you play the role of one of the main characters.

You usually begin such a game as a low-level novice character who has certain rankings for intelligence, strength, wisdom, dexterity, and so on.

You guide your character through a magical dungeon, a spaceship, or some other kind of strange world, maybe even the subways of New York. You travel through the world, fighting against monsters, meeting sages and dolts, and collecting magical or monetary treasures. As you accumulate experience points and treasure, your character gains power.

The goal may be very specific—finding the silver sword and leading the good army against the evil magician, for example. Once you defeat the bad guy and save the princess, the game's over. In a sense, the game is playable only once, although it may take you six months or longer to solve it. These games are like difficult crossword puzzles. They each have a definite answer but take a long time to solve.

Other adventure games can create brand new puzzles with brand new solutions. If you get tired of exploring one world, tell the computer to create a brand new one.

Still other adventures are open-ended. There's

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not a single goal, but there's lots of territory to explore.

Adventure games are not for everyone, but can be great fun. You don't really need to worry much about them being playable only once.

The Smallest Piece Of Information

More and more, I see articles refer to bit manipulation. The November GAZETTE said that on a VIC-20 the first three bits of 36879 control the border color. Bit #3 (fourth bit, actually) controls normal/reverse text. And the top four bits control screen color.

I realize that POKEing 36879 will change border and screen colors, but I can't break it down to a bit by bit level. Does it follow binary rules?

Larry Nichols

Although you POKE using decimal, your VIC stores the numbers in binary, using bits, the smallest piece of information.

For example, if you POKE 36879,43 on a VIC, the screen is red with a cyan border. You might think of the number as 43, but the VIC stores it as 00101011. The first three bits (starting from the right) determine the border color, which means that anytime you POKE a binary number xxxxx011 into 36879 the border is cyan (the x's can be 0's or 1's—it doesn't matter). And anytime you POKE 0010xxxx into 36879, the screen will be red.

Here's an easy conversion routine to get from decimal to binary. Let's say you want the binary equivalent of decimal 43.

```
divide by 2  0 0 0 1 2 5 10 21 43
remainder    0 0 1 0 1 0  1  1
```

Write down 43 and divide it by two. The answer is 21 (write it to the left of 43), with a remainder of 1 (put it underneath). 21/2 is 10 (remainder of 1). 10/2 is 5 (no remainder). And so on, until you reach 1/2 is 0 with a remainder of one. From then on, it's all zeros. The pattern of ones and zeros underneath is the binary equivalent of the number you started with.

For more information about bits and memory, see the March "Machine Language for Beginners" column. For more about turning bits on and off with AND and OR, see last month's "GAZETTE Feedback."

Using Capital Letters

I've been trying to write a program that handles chemical elements:

```
10 forx=1to4:reada$:printa$:next
20 data Na,Cs,Ba,Cl
```

While the computer is in lowercase mode, it won't accept uppercase letters in DATA statements. It prints a, s, a, and l. How can I get my 64 to read the capitals from DATA?

Paul Porter

The solution is to enclose each item in quotes:

```
20 data "Na","Cs","Ba","Cl"
```

This allows you to have DATA lines with capital letters as well as special characters like cursor movements and color changes.

The first quotation mark signals the beginning of quote mode, which makes the computer READ each item literally. The second quotation mark is necessary to get out of quote mode, so the commas can separate the individual DATA items.

This same method can be used to put capitals and graphics characters into REM statements.

To make sure you're in upper/lowercase mode, PRINTCHR$(14) at the beginning of the program. Printing CHR$(142) gets you back to uppercase/graphics. To prevent the user from accidentally pressing SHIFT-Commodore key, PRINTCHR$(8) to disable the case change. CHR$(9) re-enables case changes.

Printing Quotes Inside Quotes

Is it possible to use quotes (") to show a title inside a PRINT statement? For example,

```
10 print"The story "A Wrinkle In Time" is an
   interesting book."
```

Johnny Petroschek

Quote mode bedevils many new owners of Commodore computers.

Letters inside quotes are just letters and can be used in PRINT or DATA statements. Outside of quotes they're treated as variable names.

There are two ways to force the computer to print quotes:

```
10 print"The story ";chr$(34);"A Wrinkle In
   Time";chr$(34);" is an interesting book."
10 print"The story 'A Wrinkle In Time' is an
   interesting book."
```

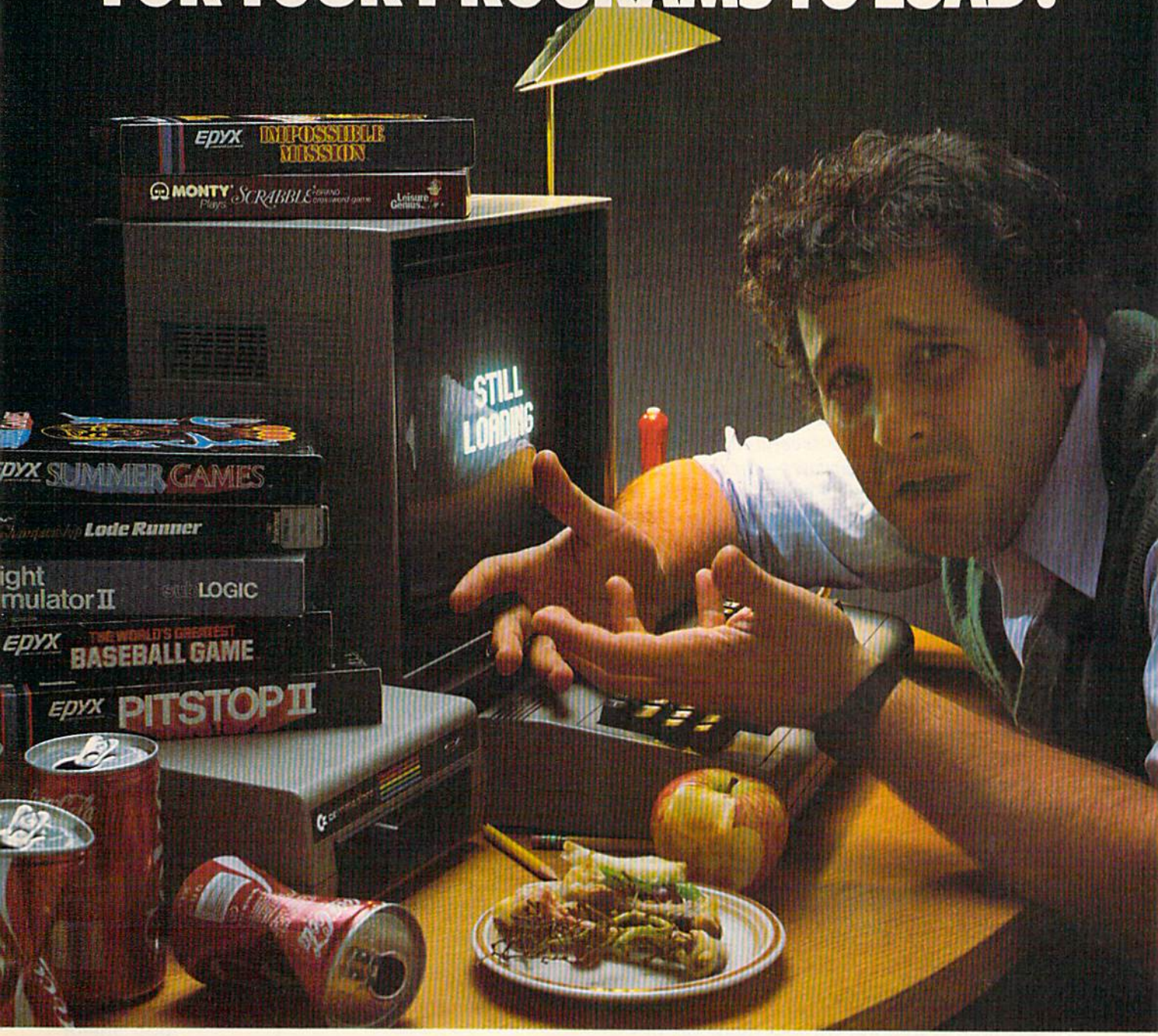
*CHR$(34) is the quote character, and you can print a CHR$(34) anytime you want quotes. But you have to get out of quote mode first, otherwise you'll get the letters c-h-r-$-(-3-4-). To simplify things, define a string variable at the beginning of the program,* **bk$=chr$(34)+"A Wrinkle In Time"+chr$(34)** *and then use bk$ in any sentences that mention the book.*

Or you could use apostrophes (single quotes) in place of real quotation marks by typing SHIFT-7 as a replacement. Apostrophes do not affect quote mode.

Telecommunications And Tape

Nearly all software for modem operations requires a disk drive. Is this a message for us tape

TIRED OF WAITING FOREVER FOR YOUR PROGRAMS TO LOAD?



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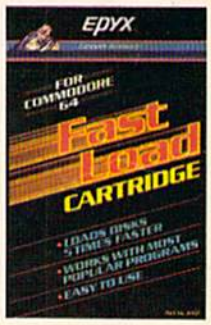

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users to abandon our cassettes and purchase a disk drive? Are tape operations incompatible with modem operations?

David Rice

Yes, tape operations are essentially incompatible with modem operations, with some exceptions.

Timing is very important when you're using tape. When you read from or write to tape on a 64, the screen goes blank. The raster interrupt routine, which refreshes the screen, takes too much time, so the screen is turned off during tape operations.

There's another type of interrupt, called a Non-Maskable Interrupt (NMI). RUN/STOP-RESTORE causes one type of NMI. The RS-232 port (including modem communications) can also cause an NMI. As the name suggests, "nonmaskable" means the interrupt cannot be stopped (masked).

RUN/STOP-RESTORE always interrupts tape operations. Similarly, a signal received from the modem always interrupts the computer. Both can disrupt tape communications.

Furthermore, there are several memory locations which serve dual purposes—they are vital to both RS-232 and *Datassette communications. Location 171, just one example, functions as RS-232 input parity during modem operations and also as the cassette leader count. Some of these bytes are likely to be garbled if you try downloading directly from modem to tape.*

This incompatibility prevents you from using a cassette drive while you're online.

But there is telecommunications software available on tape. You can load the program from tape before *making the connection (as long as the cassette drive is off while you're logged onto the bulletin board or network). And some software allows you to download to memory and later, after you hang up, save the memory to tape or disk. One example is "PlusTerm," published in the February 1985 issue of* COMPUTE!, *our sister magazine. It downloads to a memory buffer, and you can later save the file to tape or disk.*

What Is Hi-Res?

What is high-resolution (hi-res) mode, as opposed to the normal screen mode? I've tried the four-line program on page 123 of the *Commodore 64 Programmer's Reference Guide*, but get only the "garbage" they describe.

David G. Diedrick

Normal screen mode is 40 characters wide and 25 lines long on a 64, Plus/4, and 16. A VIC screen is 22 characters by 23.

POKEing characters to the screen is low-resolution, 256 characters in 1000 (40 × 25) positions (506 on a VIC).

But the screen of a 64, Plus/4, or 16 is really 320 dots across (40 characters, each 8 dots wide) and 200 dots down (25 × 8). The dots are usually called pixels, an abbreviation for picture elements. Hi-res mode turns these individual pixels on and off.

The Commodore 64 has a special hi-res mode. Instead of 1000 characters on the screen, there are 64000 (320 across by 200 down) different pixels to switch on and off. Unfortunately, the details of how to program in hi-res would require a separate article (see "Hi-Res Graphics Made Simple" in the August 1983 GAZETTE *or* COMPUTE!'s First Book of Commodore 64 Sound and Graphics). *You could also consider the purchase of the 64 Super Expander (see the November 1984* GAZETTE *for details).*

To get hi-res on a VIC, you must redefine characters, printing them to the screen and turning pixels within the custom characters on and off. COMPUTE!'s First Book of VIC *contains programs to do this.*

The Plus/4 and 16 are even more sophisticated, with a built-in hi-res mode and BASIC commands like GRAPHIC, BOX, CIRCLE, DRAW, LOCATE, and PAINT. These commands make it simpler to work in hi-res.

VIC/MPS-801 Compatibility

Commodore has started marking their MPS-801 printers "FOR USE WITH THE C-64 ONLY." Figuring it would work with the VIC-20, I bought one. Besides, the salesman said it was returnable.

Some listings printed very well, others did not. The 801 has a 90-character buffer and the VIC transmits data faster than the 64. It seemed to me that this combination was causing the buffer to overflow.

Then you published the solution to the problem in the November GAZETTE. The "Slowpoke" program from "Power BASIC" slows down printed output to the screen or printer. POKE a speed number 3 (in line 10) for program listings. Printing graphics requires a higher value, 10 or more. It's the answer to the incompatibility of the VIC and 801.

Bob Shelor

You've found an interesting, though unintended, application for "Slowpoke." We're sure some of our readers will appreciate this information.

You're right about the VIC being fast. It consistently beats the 64 and Plus/4 in benchmark tests. A VIC not only calculates faster, it sends signals to peripherals faster. The 1540 disk drive, originally designed for the VIC, transmitted data too quickly for the 64 and was deliberately slowed down when it became the 1541. Also, the screen has to blank when loading programs from tape into the 64, to give the processor a little more time.

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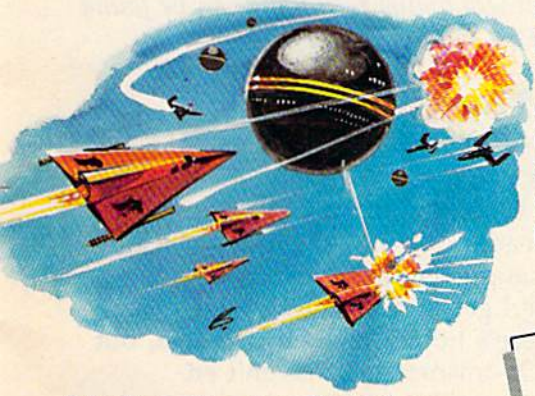

Martian Prisoner, The Viper, Skydiver, Snake Escape, Demon Star, Cyclon Zap, and Oil Tycoon are just a few of the ready-to-run games you'll find exclusively in *COMPUTE!'s Gazette* each month. Just type in the programs and watch your screen explode with colorful new computer game excitement.

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Is Terminal Software Necessary?

Can I use the 1650 Automodem even without the terminal software?

Steve Myers

Without software, the modem won't be much good for communicating. The software is what makes the hardware work.

The 1650 is packaged with a terminal program. The outside of the box should indicate whether a tape or disk is included.

Later in your letter you say you have a disk drive and happened to get the terminal software on tape. If you know someone who owns a Datassette, you should be able to copy the program to disk (load from tape and save to disk). Or contact Commodore Customer Support at (215) 436-4200 and arrange to get a copy of the software on disk.

Reading Sprite Collisions

I am writing a machine language game, but am experiencing difficulty with detecting the collision of two sprites. How do you check for the collision of sprites one and two in machine language?

Cameron Mackenzie

You detect sprite collisions in machine language (ML) much the same as you do in BASIC, although the speed of ML introduces some difficulties.

In BASIC, once you've defined the sprites and started moving them around the screen, PEEK(53278) tells you if two or more sprites have collided. A zero indicates no collisions; any other value means two or more sprites have bumped into each other. Collisions can occur on or off the screen area. If a sprite is turned off, it cannot be involved in a collision.

A sprite fits into a rectangular area 24 pixels across, 21 pixels down. In single color mode, pixels can be on (visible) or off (transparent). The collision register at 53278 only checks for visible pixels. If a transparent pixel from one sprite overlaps with another, there's no collision.

You also have to be aware of several quirks.

Multicolor mode lets you paint sprites with up to four colors. Color zero (00) is the same as the screen color, and counts as transparent. Color one (01) is taken from the first multicolor register. It also counts as transparent. Even though you can see color one on the screen, the collision register recognizes only colors two and three.

The eight bits of 53278 correspond to the eight available sprites. Multiple collisions are hard to decode, however. If sprite zero hits sprite one, and number two hits number three, PEEK(53278) yields a 15 (binary 00001111). You can't tell by the bit pattern which sprites collided with which others.

Finally, PEEKing 53278 clears (sets to zero) the register. It will stay cleared until another collision happens. BASIC programmers should store the value in a variable; ML programmers should store it somewhere in available memory.

This last feature is related to the "screen refresh routine." Sixty times a second, a special chip in the 64 redraws the screen. At the same time it draws sprites and sets the collision register.

Machine language instructions run much faster than 60 times a second. In between screen refreshes, the computer can execute a few thousand ML instructions. You may have to synchronize the program with the refresh routine or slow it down to get good readings from the collision register.

There's also an advanced ML technique where you set up an IRQ interrupt to occur whenever two sprites collide. Memory locations 53273 and 53274 control this type of interrupt (they're also used for raster interrupts and reading light pens). Information on this programming technique can be found in Mapping the 64 *from COMPUTE! Books.*

DOS And The Wedge

I recently purchased a 1541 disk drive and have a few questions regarding the Disk Operating System (DOS). When I run the DOS Wedge, I get the DOS Header of V5.1/071382. But if I use the reset command @UJ, then read the error channel with @ I get 73,CBM DOS V2.6 1541,00,00. There's no error when I do this, but is it really a DOS mismatch? I haven't encountered an error #73 any other way.

Dave Hite

There's only one Disk Operating System in your 1541. It's there, inside the drive, whenever you turn on your 1541. It's a program stored in the disk drive's memory. The DOS Wedge program on the 1541 Test/Demo disk (packaged with the drive) is a program which loads into your computer's memory.

Having the Wedge program running (in your computer) makes it easier to access the various disk commands (in the drive).

It doesn't matter much which version of the Wedge is working with which version of the 1541 DOS. You have version 2.6 of DOS and version 5.1 of the Wedge (written on 071382—July 13, 1982, which was not a Friday the 13th, in case you're superstitious). They're two separate programs, and the version numbers are not related to each other.

Error 73 shows up when you try to use a 1541 with a disk formatted on one of the earlier Commodore drives, like the 2031. The two disk drives are read- but not write-compatible.

The version number (and a false error 73) also appears in the error channel when you first turn on the disk drive, or reset it using UJ. It's not a real error 73, it's more like an announcement of which version of DOS you have.

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Telecommunications Step-By-Step

Selby Bateman, Features Editor

Taking the plunge into telecommunications can be as exciting and challenging as any aspect of computing. But to get the most out of this burgeoning field, you need to understand the basics bit by bit.

When horror novelists Stephen King and Peter Straub recently collaborated on the bestselling book, *The Talisman*, their work had an unusual twist. The coauthors exchanged portions of the manuscript almost instantly whenever they felt like it—even though they were at opposite ends of the country.

King, from his home in Maine, reportedly sent and received new material and revisions over the telephone as his word processor telecommunicated with Straub's in California.

King and Straub are not the first to use this form of communication. Theirs is just one example of the many ways computer-based communications is changing how we work and play. Thousands of Commodore owners are already telecommunicating—connecting their computers to other computers by telephone line. And if industry figures are correct, thousands more are venturing into this field each month.

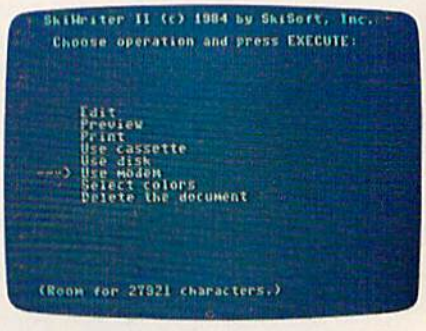
For many computer owners, however, telecommunications is an intimidating and confusing procedure. Users who are excited about learning to program or to use word processors and other commercial software, in many cases won't take the step into telecommunications. And yet many students of technology believe this aspect of computing holds the greatest promise in the long run.

"I never got into telecommunications because I was never convinced that there was much out there that I wanted to tie into. And I was intimidated," admits Ken Skier, a long-time computer user who not only conquered his reservations, but went on to write *SkiWriter II*, a "communicating" word processor available for the Commodore 64. "Parities, stop bits, word length—there's an awful lot of jargon associated with telecommunications; far more than with any other aspect of personal computing."

Once he was convinced that telecommunications indeed held rewards for computer users, Skier went further and decided that the most useful combination would be software which would let the user easily mix writing (word processing) and communicating.

"Nobody does telecommunications as an end in itself," he argues. "You don't get online with CompuServe (a telecommunications network), and just get some information. You get some information in almost all cases because you're writing something."

When Skier began to develop his program, he knew personally what daunted many would-be users. "I didn't have to wonder what the newcomer to telecommunications might fear—because that was *me*."



SkiWriter II's *main menu shows the menu format which allows you to move from word processing to telecommunications.*

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SkiWriter II and an increasing number of other telecommunications programs are broadening the accessibility of this growing field. The ultimate goal, of course, is to make telecomputing as easy as using the telephone. But as Skier is the first to admit, we're a long way from that.

Many terminal programs still require a user to make a variety of decisions, some of which can be intimidating to a newcomer.

Perhaps the easiest way to untangle the jargon is to follow the path taken by some information, from the time it leaves your fingers at the Commodore keyboard to when it reaches the phone lines.

Sending a message via computer means following certain rules, just as a cross-country vacation would necessitate a plan, a vehicle, adherence to specific travel requirements, and a destination. A telecommunicating computer has its own set of similar preparations. They may at first glance seem far more confusing, but that's only because you're not yet familiar with them.

Before deciding on a message, first we need the basic system components to begin. As most computer users quickly learn, there are only three things needed to get started other than the computer: a *modem*, which connects the computer to a *telephone*, the second component; and a *terminal program* which lets you tell the computer and modem what, when, how, and where you want to send.

Commodore owners have a growing field of modems and terminal software available. Their capabilities, complexities, and prices vary widely. Before explaining how these two components work together, let's turn for a moment to the keyboard and our message.

When Alexander Graham Bell shouted into one of his early telephone transmitters, *Mr. Watson, come here, I want you!*, his assistant, Thomas A. Watson, heard the words several rooms away as they filtered unevenly through a test receiver. Those words, so the story goes, made up the first telephone transmission. If we type those same words into a computer with the intent to transmit them to a friend's computer, we can quickly see some major differences and similarities between computer *data* transmission and telephone *voice* transmission.

The telephone we use today is an *analog* device, as was the crude instrument Bell used for the first transmission. An analog system is one that accepts continuous values between two extremes. A painter, for example, can mix black and white into a variety of different gray-tones. The sounds sent over the phone lines are analog. But as we prepare to send our message via computer, each letter, or *character* is represented in the computer's memory in discrete *digital* form. Each bit in memory holds a one or a zero; there are no "gray" numbers in between.

When Bell shouted his message to Watson, his voice tones were converted into a series of modulating electrical impulses. But when we type those same words into the computer, they become a string of ones and zeros—the binary language which is the heart of a computer's number processing. Whether we think of these ones and zeros as on/off or yes/no states, your Commodore computer treats each character in the sentence as a row composed of *bits* of data.

Each letter, number, or graphics character in your computer has its own assigned digital representation. In order for these to be uniform, most computers follow the *American Standard Code for Information Interchange (ASCII)* formula, a standardized method of encoding characters.

In standard ASCII, *Watson* becomes the following binary code: 1010111 (capital *W*), 1100001 (lowercase *a*), 1110100 (*t*), 1110011 (*s*), 1101111 (*o*), 1101110 (*n*). All computers which use what is called *true* ASCII will be able to interpret that. Commodore, however, uses its own form of ASCII (called Commodore ASCII or PETASCII), which varies somewhat from the above. One difference is that true ASCII uses seven bits per character, while Commodore ASCII uses eight. As our message is being prepared for departure from the computer, the binary bits must be arranged in a particular fashion in order to travel successfully to another computer.

When your fingers type the letters W-a-t-s-o-n, they're temporarily stored in memory. Before transmitting, they may have to be translated into true ASCII.

That's where we pick up the intertwined functions of the modem and the terminal software. The modem will convert our digital message into an analog format compatible with the telephone lines. And the terminal software will make sure that the message is prepared properly for the journey.

Perhaps the most popular modems for the Commodore 64 and the VIC-20 computers are Commodore's own 1600 VIC-Modem and 1650 AutoModem. New modems from Commodore are being introduced, and a host of other companies have created modems for these computers. Although the capabilities and prices vary, the basic function of

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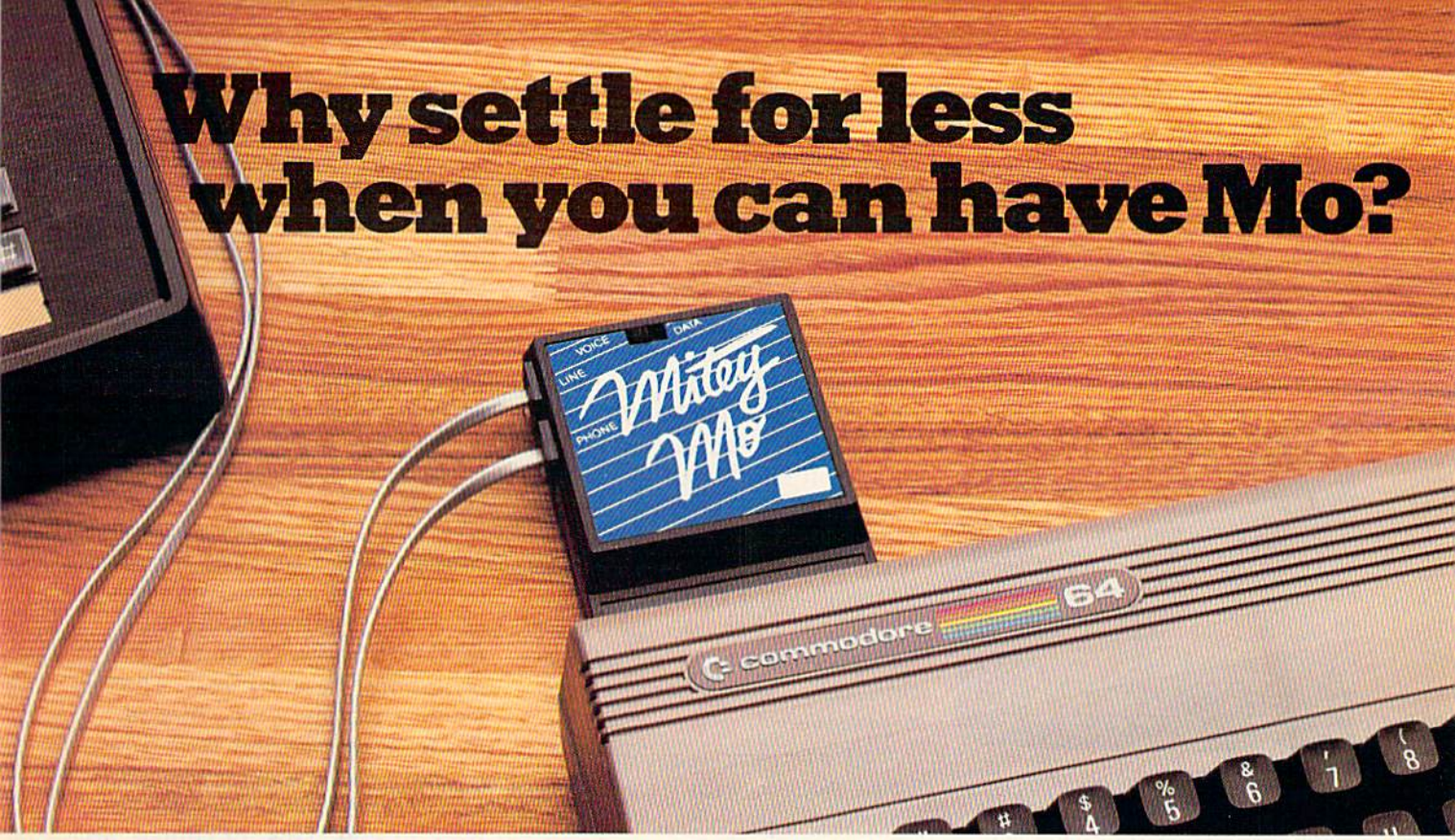

Mitey Mo turns your Commodore 64 into a telecommunications giant. It's the best-performing modem with upload/download.

Mitey Mo is being hailed as "the best price/performance communications package available." Its software has received the endorsement of the U.S. Commodore Users Group, which gives a money-back guarantee to members. It is truly the industry standard, and no wonder. It's the most user-friendly modem you can buy—it will take you online faster and easier than anything else.

Mitey Mo opens up a world of practical and exciting uses for your C-64. It lets you send and receive electronic mail, link up with community bulletin boards, play computer games with people in distant places, tap into library resources, and much more. All at your convenience.

Until Mitey Mo, Commodore's 1650 Automodem was the obvious choice when you went looking for a modem for your computer. Like Mitey Mo, it has "auto answer"—it receives data while unattended. And both modems are "auto dialers"—you dial right on the computer's keyboard. But that's about where the similarity ends.

Mitey Mo can dial up to 9 numbers sequentially. But suppose you dial a number and find it's busy. Mitey Mo has "auto redial"—it hangs up and redials immediately until it gets through. With the other modem you have to redial each time—and somebody with auto redialing can slip in ahead of you.

Mitey Mo is menu driven. It lists the things you can do on the screen. Select a number and you're on your way. Since Automodem isn't menu driven, you'll be hunting through the manual a lot.

With Mitey Mo, your computer's function keys are programmable—you can save yourself plenty of keystrokes. Not so with the other modem. And only Mitey Mo lets you store data to review or print it later.

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Smart 64 Software	YES	NO
Function Keys Programmable	YES	NO
Upload/Download Text & X-Modem	YES	NO
VT-52/VT-100 Emulation	YES	NO
Menu Driven	YES	NO
28K Software Buffer	YES	NO
Easy-to-Use Manual	YES	NO
Bell 103 Compatible	YES	YES
Multiple Baud Rates	YES	YES
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Single Switch Operation	YES	NO
Warranty	3 years	90 days

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all modems is to *modulate* outgoing digital data into analog tones and to *demodulate* incoming analog sounds into digital form. Hence, *modem*, MODulate-DEModulate. The modem is connected to the user port on the computer, and this is where the computer will route our message.

VIP Terminal, *one of the most powerful and flexible terminal software programs for the Commodore 64.*

There are only three decisions to be made in order to prepare the modem, and three other basic options for the terminal software. Although many more possible changes can be made in sending and receiving information, they are either advanced techniques you'll learn (if you need them at all) after the basics or simply cosmetic alterations. While these first six settings certainly qualify as part of the telecommunications jargon Skier mentioned, they are relatively painless once you understand their functions.

Before our message enters the modem from the computer, the three things the modem must know are 1) whether we are originating or receiving data, 2) what speed our data will travel, and 3) whether we will have our message echo back to us letter by letter as a form of error-checking. Put another way, these options are the *mode* (originate or answer), the *baud rate* (speed measured in bits per second), and *duplex* (full or half).

If we wish to send a message, we would set the modem to originate and our destination computer would be set to answer. However, as long as the two computers are set on different modes, they can both send and receive.

The speed of transmission for most Commodore telecommunications is between 0 and 300 bits per second (bps), or, more commonly but less technically correct, 300 baud. There are modems and terminal software which handle higher transfer rates—such as 1200 and even 2400 bps—but they are less prevalent among Commodore users and generally more expensive.

If we think again of the word *Watson*, with its seven binary digits per letter, we can get a better idea of the speed of 300 bps. Each letter can have as many as three or four extra binary digits—ones or zeros—as a part of the way in which the terminal software packages the data for transmission. So, if there are approximately ten bits per letter, or character, being sent, then 300 bits per second translates roughly into 30 characters per second. Our word, *Watson*, would take approximately one-fifth of a second to send at 300 bps. And Bell's entire sentence to Watson would require about one second. 1200 bps transmission would be four times faster, and 2400 bps, eight times more rapid than 300 bps.

One of the oddities of our telephone network is that it's currently in transition from an analog system to a digital system. Eventually, all telephone signals will be digital, but the process of changing the mammoth telephone grid takes time. For now, your computer will send digital bits to the modem, which will translate those into an analog signal. It will then likely travel on local lines in analog form until it reaches a main switching station, a microwave carrier, or a satellite transmission. Since an increasing number of these are now becoming digital carriers, your message may well be translated into digital form again through *pulse code modulation*, then back to analog when it arrives at another local telephone system, and finally demodulated to digital in your target computer's modem—all in less than a second.

The third option, duplex, provides the capability for error detection between sending and receiving computers. At full-duplex, a receiving computer echos the character sent. That is, if you type the word, *Watson*, the letter *W* on your screen is actually the character received at the other computer and sent back to you. This, of course, applies to each character you send. If the phone lines are noisy, you may see a mixed-up message of random characters. Since the terminal software and some modems each have full- and half-duplex settings, follow your terminal program's directions carefully on this option.

For example, if you type in the word *Watson* and the screen shows *WWaattssoonn*, your terminal program (sometimes your modem) is probably set for half-duplex and should be set to full-duplex. In half-duplex, the character you send is not to be echoed back, and the letters you see on your screen are generated directly from your own computer—not an echo. Any double-lettering on your screen is an indication that your duplex setting is causing your computer to produce a character on the screen at the same time that the other computer's echo is appearing.

Terminal software exists solely to manage the transmission of data, telling the modem what to do and communicating with

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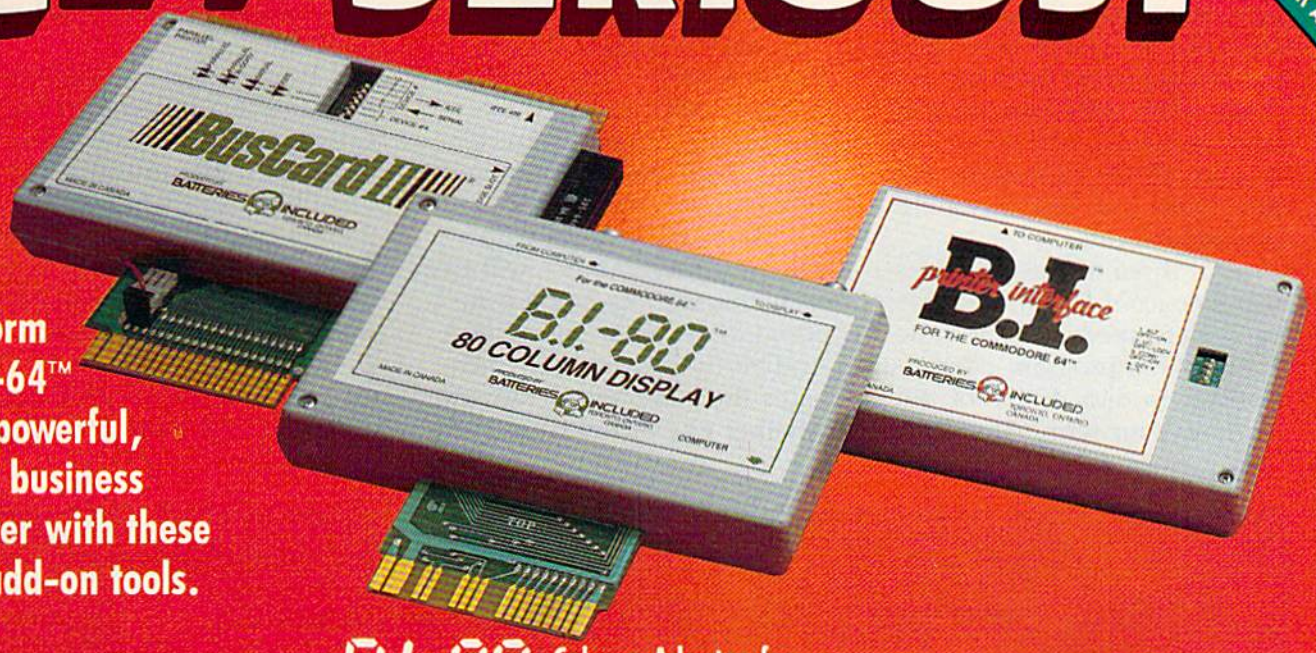

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the computer and peripherals such as disk drives and printers. Although terminal programs can vary widely in their approach and ease of use, there are only three major options here which you should learn from the start. While these decisions are a bit more technical, you don't need to learn all of the reasons *why* they work, just *how* they help us communicate.

All three of these options—*stop bits, word length,* and *parity*—relate specifically to how the terminal program packs our message in digital bits for the journey. Your terminal software should help you make these decisions painlessly, depending on the type of telecommunications you're conducting.

A *stop bit* (sometimes more than one) is added, during transmission, to the end of each string of seven or eight bits making up a single character. This bit tells the other computer where one character stops.

Word length deals with whether the computer will treat each character as being composed of seven or eight bits. And *parity* is a setting which helps the computer determine whether any errors have been made in transmission. There are several different possible settings, but they all simply ask the computer whether what was sent matches exactly what was received.

Whether you're sending a message to a friend's computer, gaining access to one of the large telecommunications services like CompuServe, The Source, and Dow Jones/News Retrieval, or connecting to a computerized *bulletin board,* these will be the basic decisions from which to start.

Many terminal programs default to the most commonly

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used parameters:

Modem settings (selectable by switch on modem or through software): full duplex, 300 baud (bps), originate (not answer).

Transmission: 0 parity (or none), 1 stop bit, word length 8.

If you're calling a bulletin board or telecommunications service for the first time, select these options before dialing.

Although novice computer users often throw up their hands as the telecommunications decisions mount, Ken Skier says that the process doesn't have to be intimidating. "There *is* some anarchy in telecommunications, just as there is in personal computers generally. But there's a lot more standardization than I had originally expected. And it turns out that there is a configuration for stop bits, parity, and word length that works on just about all telecommunications services."

The manufacturers of modems and terminal software have been steadily making the road to telecommunications easier and more flexible over the past few years.

The Commodore 64 menu from CDI's Mitey Mo *modem terminal software.*

"We first started out developing communications software on the Commodore 64 with the assumption that most users would be using such a product for tie-in to services like CompuServe," says Joseph O'Hara, president of Microtechnic Solutions. His company has created the terminal program accompanying CDI's Mitey Mo modem for the Commodore 64 and Plus/4 computers.

"However, we were quite surprised over a period of months to find that users were buying it for all kinds of services. We've gone through a number of revisions in our product to try to keep up with the users," he adds.

For those who have hesitated on whether to try telecommunications with their computers, O'Hara says that too many people overlook the obvious: "One of the problems novices have is that they don't have a clear idea of what they want the software to do when they go out and buy it. And consequently, they're often disappointed."

Before getting started on the wrong foot with telecomputing, take the time to learn a few of the basics. The following brief glossary will help you to decipher some of the other key words used in telecommunications:

- *Auto-Answer*: the ability of certain modems and computer systems when left on to automatically answer incoming calls from other computer modems.
- *Auto-Dial*: a capacity of some modems (with the appropriate software) to automatically dial other computers. Some will re-dial if there's a busy signal.
- *Buffer*: an area in your computer's memory in which text, programs, or files may be stored temporarily while you are downloading or uploading data.
- *Bulletin Board System*: a public access service based on a computer system with an auto-answer modem to take messages, provide a public forum, and possibly offer programs.
- *Carrier Signal*: the signal by which a computer indicates to another computer that it is ready to establish a communications link.
- *Downloading*: receiving data, such as a file or a program, from another computer.
- *Modular Connection:* a type of telephone connector used in today's phone system which allows you to directly connect your modem to the telephone rather than having to place a telephone handset into the two cups of older *acoustic* modems.
- *RS-232-C*: a *Recommended Standard*, hence RS, for *serial* communications with a modem, printer, or other device. Computers without a built-in serial interface often require an external interface in order to attach an RS-232-compatible modem. The Commodore 64 handles its RS-232 communications through the user port. (See "Commodore Peripheral Ports" in the March GAZETTE.)
- *Uploading*: sending data, such as a file or a program, to another computer.

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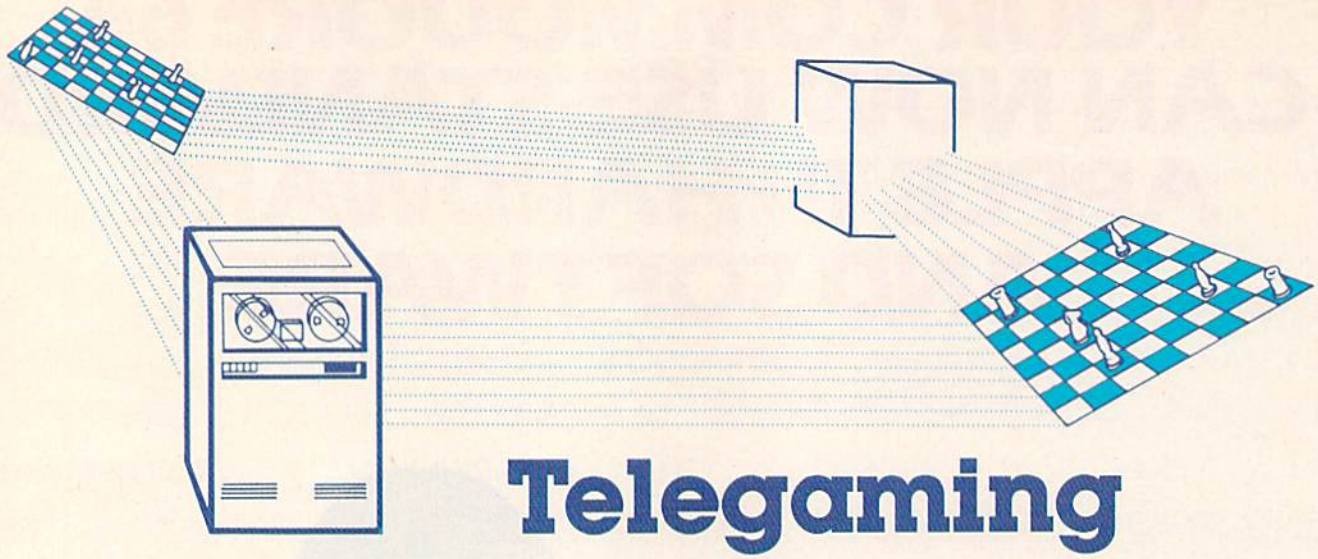


Telegaming

Kathy Yakal, Feature Writer

Can't find a challenging chess partner? Looking for a better way to meet people than by leaving messages on electronic bulletin board systems? Telegaming is one of the fastest-growing applications of telecommunications. Here's how you can get involved.

It isn't a terrific party, but it's too early to go home. *Let's play a game,* someone suggests. But nobody can remember all the rules to contract bridge. The Monopoly set is missing too many pieces. Everyone has memorized most of the answers in the first edition of Trivial Pursuit. And some people are starting to yawn. *Well, maybe there's something on television.*

It's not easy to get a group of people to agree on which game to play, what the rules are, and how long to play. Telegaming—playing games over the phone lines via a personal computer and modem—doesn't solve the problems of indecision or tired players. But it offers new ways to play old games, thousands of potential challengers across the country, and computer games designed specifically for use on telecommunications networks.

CompuServe and The Source are probably the two best-known networks that offer telegames. Recently, several new networks have gone online for the sole purpose of providing communication and recreation.

Long-distance gaming is not a new concept. People have been playing games by mail for years. One person takes a turn, records it and sends it to his opponent, who does the same. A round of chess could take months.

Software developers are looking for ways to speed up that process, whereby you can link two personal computers via modem and play directly between them. No third party (like a telecommunications network) would be necessary. While this would allow you to play a game with your cousin in Cleveland in real time, the long distance charges could become rather costly if you happened to live in Nova Scotia.

Telecommunications networks allow you to find compatible game partners (through electronic mail, game forums, and online conversations) and play a wide variety of games, ranging from simple board games like checkers to CompuServe's highly interactive, fast-paced *MegaWars.*

You must subscribe to the service to gain access to any of its features. Most charge a one-time new subscriber fee, hourly online charges, and, sometimes, additional charges for games. Once you've signed up and received a password, using the system is generally no more difficult than calling an electronic BBS.

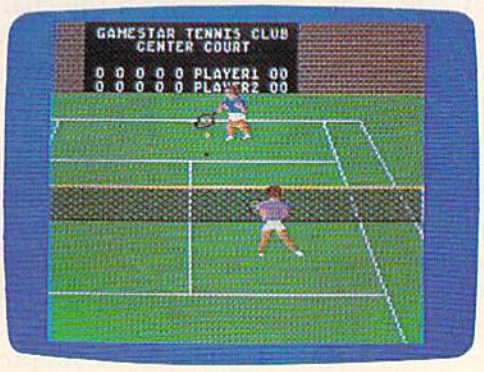
A word of warning here: Be sure to read the documentation that comes with your membership packet. Menus and help commands within the system itself will guide you to and through the game functions, but being prepared will save you online charges.

The creators of these networks report something interesting: Consumers don't necessarily demand the same richness and depth of play they would normally expect of a videogame. The old favorites, when played with someone a thousand miles away, are just fine for now.

Further, telegaming seems

ALL TENNIS GAMES ARE NOT CREATED EQUAL

Over the years, game designers have brought several versions of "tennis" to the home screen. Unfortunately, they all resemble Atari's ten year old classic, Pong™. Good games all, but not real tennis.



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Actual Commodore 64™ screen—Other versions may vary

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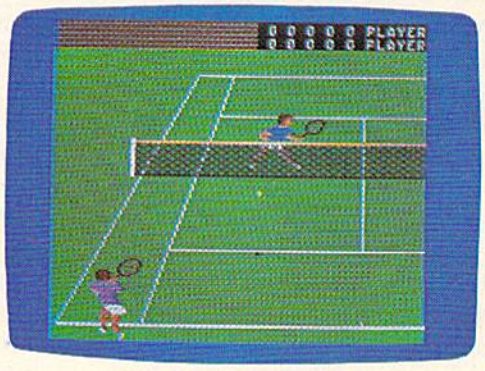

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to be reviving interest in games where popularity has waned. "Bridge players and coffee drinkers are about the same. All of us are dying off at the top end," says Terry Beam, director of marketing for PlayNET, a Troy, New York-based telecommunications network. "Both of those activities are associated with older people. It's a dying thing.

"But now there are a lot of people playing games they haven't for years because there is a new way to play it. They're finding a new excitement that wasn't there before. You can play a hand of bridge with someone in Sacramento, someone in Minneapolis, and someone in New York at the same time."

PlayNET began full operation in October 1984, after several months of market research. Unlike other major networks, PlayNET chose to make the software compatible only with the Commodore 64 because of its high household penetration.

Finding game partners once you've logged on to the system is accomplished through PlayNET's online conversation feature, similar to the CB simulator on CompuServe. Instead of switching channels, you move into different "rooms," trying to find someone who will set up a game with you. (Or, if you like, you can just chat with people.) PlayNET's monthly calendar lists scheduled tournaments for interested competitors.

PlayNET asks a one-time registration fee of $39.95, $6 per month maintenance charge, and $2 per hour online billing. The system can be accessed either through a local Telenet number or direct dial to their New York number. Hours are 6 p.m. to 7 a.m. (Eastern Standard Time), and 24 hours on weekends and holidays.

Games currently on PlayNET include traditional favorites like backgammon, chess, checkers, and hangman; games written especially for the Commodore 64 like *Quad 64* and *Sea Strike*; and some not-so-familiar games like the ancient Oriental game, Go. PlayNET has been working with the American Go Association, which is pleased to be able to introduce this strategy game to a whole new audience.

"We created PlayNET to be fun and affordable telecommunications for everybody. That's what it's all about. People are looking for ways to communicate with each other long distance at a reasonable price, to entertain themselves, to utilize their personal computers."

If you're playing Monopoly and someone quits, the game is over, unless you want to divvy up that player's property and money among the other contestants. That's the way it is with most games.

PlayNET was designed to simulate real-life gaming situations as closely as possible. So if a player drops out, the mainframe computer that runs the system does not come in to finish the game. Nor is it available as an opponent at the start of a game. It's there to maintain the system. "We wanted PlayNET to be a system that the subscribers control," says Beam.

CompuServe, on the other hand, has allowed the option of playing against the computer since games were first offered on the system in August 1979. Variations of board, card, and sports games can be played against another person or the computer.

MegaWars was added to CompuServe's list of telegames in early 1982. Designed by the Kesmai Corporation, it's an interactive fantasy game in which players create their own characters and battle to dictate the direction of the universe.

Rich Baker, director of corporate communications at CompuServe, warns that *MegaWars* is not for the casual game player. "The people that play *MegaWars* are extremely serious," he says. "The expertise level is very high."

Baker advises potential players to study the manual, ask questions of other players in CompuServe's games forum, and take it slowly by starting at the first of the *MegaWar*'s three levels.

"*MegaWars* gives people the chance to be someone else, like the commander of a star ship. It's different from the challenges you face going to work," says Baker. "And a lot of the fun is not so much the game, but the interaction."

Though *MegaWars* may be the most sophisticated telegame available up to now, interactive gaming has a long way to go, according to Baker. As modems support faster baud rates (300 baud is too slow to support sophisticated graphics) and the graphics capabilities of the machines themselves improve, the interactive nature of telegames will expand.

American Home Network rang in 1985 by going online with its new telecommunications service, American People Link. Though it's billed primarily as a service for home computer owners to meet electronically, games should be available by the time you read this.

The Source and Delphi, two major telecommunications networks providing a variety of information and services, have also added games to their offerings. Besides traditional board games and card games, adventure and fantasy games are available.

Suffering from lack of funding, The Games Network did not make its planned 1984 debut.

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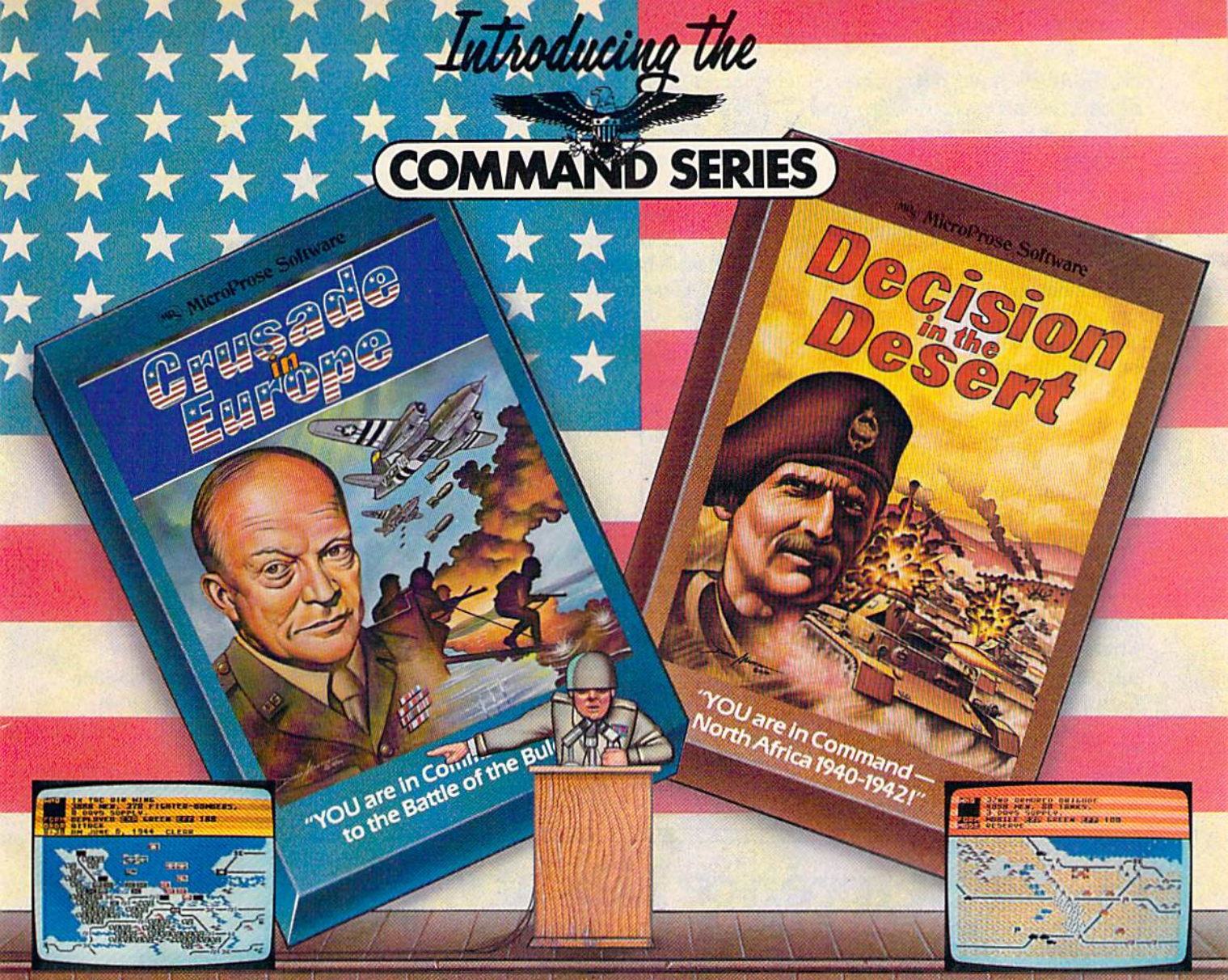
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Its founders have not abandoned the project, though, and still hope to find financial backing.

If successful, The Games Network will offer a television-based games service. Subscribers would rent a special 64K microcomputer and download a variety of educational, arcade, and adventure games provided by commercial software companies.

Any game, whether played electronically or at the kitchen table, requires a lot of thought and strategy, and, sometimes, quick reflexes. And in either kind of gaming, the interaction between players is often more important than the outcome of the game itself, says CompuServe's Baker.

Larry Dunlap, president of The Games Network, agrees. "The greatest game of all is some of the other aspects of telecommunications, ways for people to be in touch with each other through electronic mail and online conversations."

For further information, contact:

American People Link
American Home Network, Inc.
Arlington Ridge Office Center
3215 N. Frontage Rd.
Suite 1505
Arlington Heights, IL 60004
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Illinois residents call (312) 870-5200
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Delphi
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(800) 544-4005
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PlayNET
200 Jordan Rd.
Troy, NY 12180
(800) PLAYNET
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Monthly maintenance: $6
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The Source
1616 Anderson Rd.
Mclean, VA 22102
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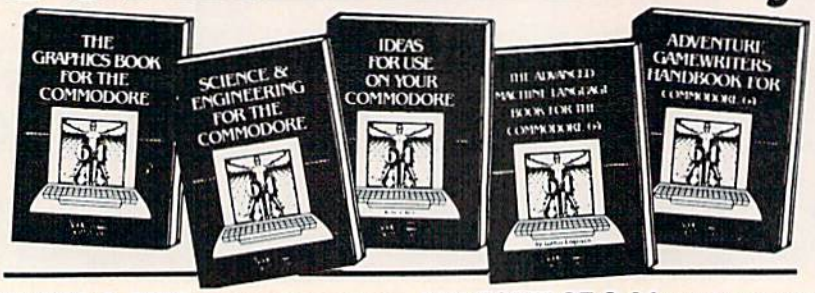
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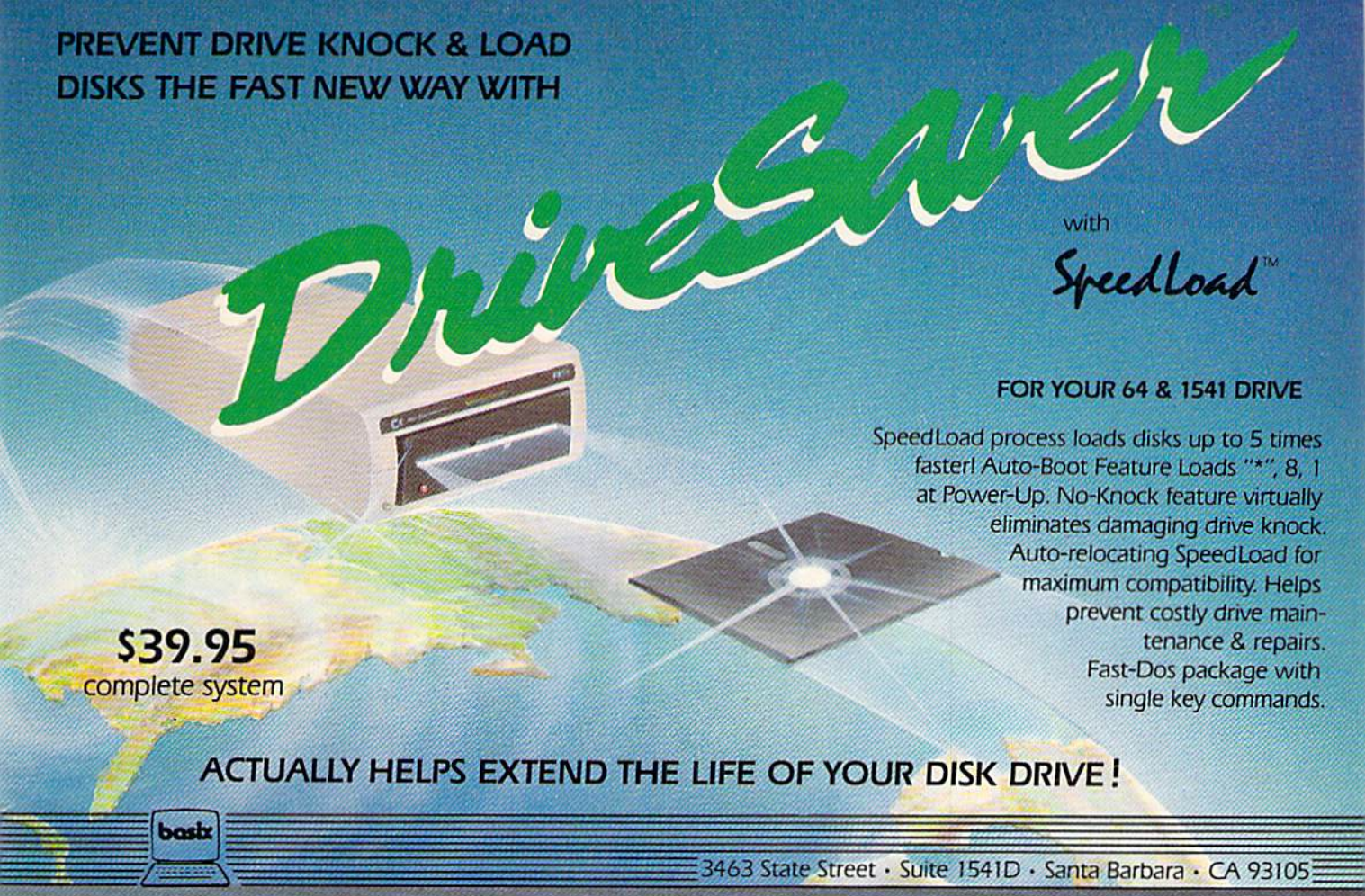

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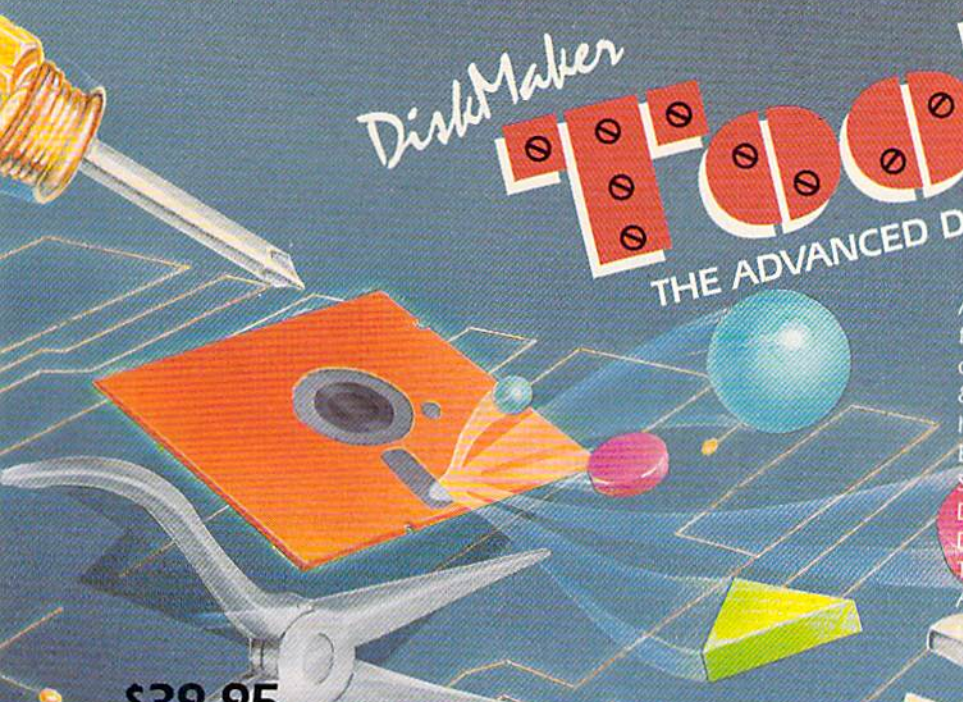

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Shoals Commodore User Group, Keith Larson, 430 Nottingham Rd., Florence, AL 35630

Huntsville Alabama Commodore Komputer Society (HACKS), Rusty Foster, P.O. Box 14356, Huntsville, AL 35815, (205) 852-9624

East Alabama Users' Group, P.O. Box 249, Jacksonville, AL 36265

Walker Area Computer Club (WACC), Daniel McGuire, P.O. Box 3193, Jasper, AL 35501, (205) 483-7833

Commodore Club of Mobile, Tom Wyatt, 3868-H Rue Maison, Mobile, AL 36608, (205) 343-1178

ALASKA

Anchorage Commodore Users Group, David M. Rowe, P.O.Box 104615, Anchorage, AK 99510, (907) 753-4218,

First City Users Group, Box 6002, Ketchikan, AK 99901

Sitka Commodore User Group, P.O. Box 2204, Sitka, AK 99835, (907) 747-3491

ARIZONA

Arizona VIC and 64 Users, Tom Monson, 904 W. Marlboro Circle, Chandler, AZ 85224, (602) 963-6149

Canyon De Chelly-Four Corners Users Group, Larry DiLucchio, c/o Calumet Consulting, Box 1945, Chinle, AZ 86503, (602) 674-3421

User Group 64, c/o Jeff Miller, 4937 West Townley Ave., Glendale, AZ 85302, (602) 939-1357

Gila Hackers, Paul R. Machula, Route 1, Box 34, Globe, AZ 85501, (602) 425-7260

Commodore User Group of Arizona, P.O. Box 21291, Phoenix, AZ 85036

Catalina Commodore Computer Club, Inc, P.O. Box 32548, Tucson, AZ 85751

ARKANSAS

Arkansas 64 Trading Post, Larry Johnson, P.O. Box 135, Biggers, AR 72413, (501) 769-2888

Northwest Arkansas Computer Users Association, Mike Mahoney, 1556 N. Leverett, #11, Fayetteville, AR 72701

Harrison Users Group, Dennis C. Loiselet, Rt. 1, Box 15, Harrison, AR 72601

River City Commodore Club, Sam A. Hendrix, P.O. Box 4298, North Little Rock, AR 72116, (501) 834-1728

Fayetteville Commodore User's Group, Bill Ferry, 916 Cedar, Van Buren, AR 72956

CALIFORNIA

California Area Commodore Terminal User Society (CACTUS), P.O. Box 1277, Alta Loma, CA 91701

Pasadena Commodore Computer Club, Ernie McDonald, P.O. Box 1163, Arcadia, CA 91006, (818) 904-0607

Auburn Commodore Computer Club, Pat Strub, 11210 Mira Loma Drive, Auburn, CA 95603, (916) 823-7095

American Program Exchange (A.P.E. 64), James Wyatt, Executor, 3820 Brave Ave., Bakersfield, CA 93309

A Bakersfield Area Commodore Users Society (ABACUS), Henry O. McCarthy, 3101 Oakridge Drive, Bakersfield, CA 93306, (805) 871-3669

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CLUB64, Robert Johnson, P.O. Box 3116, Bellflower, CA 90706, (213) 925-4049

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Fresno Commodore Users Group, Greg Edwards, 091 W. 9th, #203, Clovis, CA 93612

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DUG (Danville User Group), Kent E. Davis, 185 Front St., Suite 106, Danville, CA 94526, (415) 820-1222

Valley Computer Club, Marcia Esparza, P.O. Box 310, Denair, CA 95316

SixtyFourum, ATTN: Secretary, P.O. Box 16098, Fresno, CA 93755

San Bernardino Commodore 64 Club, Carl Gardenas, 1804 N. Dundee, Highland, CA 92346, (714) 864-4498

Hollywood Commodore 64 User Group, Martin Blackwell, 733 N. Ridgewood Place, Hollywood, CA 90038, (213) 463-8973, BBS:(213) 851-6054 7pm-7am

PALS, Jo Johnson, 886 S. K, Livermore, CA 94550

C64 Helpers, Thomas Hoy, P.O. Box 9189, Long Beach, CA 90810, (213) 424-0508

San Luis Obispo Commodore Computer Club, 1766 9th St., Los Osos, CA 93402, (805) 528-3371, BBS: (805) 528-7475

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A Printer For All Reasons

Search For The Best High Quality Graphic Printer

If you have been looking very long, you have probably discovered that there are just too many claims and counter claims in the printer market today. There are printers that have some of the features you want, but do not have others. Some features you probably don't care about, others are vitally important to you. We understand. In fact, not long ago, we were in the same position. Deluged by claims and counter claims. Overburdened by rows and rows of specifications, we decided to separate all the facts — prove or disprove all the claims to our own satisfaction. So we bought printers. We bought samples of all major brands and tested them.

Our Objective Was Simple

We wanted to find that printer which had all the features you could want and yet be sold directly to you at the lowest price. We wanted to give our customers the best printer on the market today at a bargain price.

The Results Are In

The search is over. We have reduced the field to a single printer that meets all our goals (and more). The printer is the GP-550CD from Seikosha, a division of Seiko (manufacturers of everything from wrist watches to space hardware). We ran this printer through our battery of tests and it came out shining. This printer *can* do it all. Standard draft printing up to a respectable (and honest) 86 characters per second, and with a very readable 9 (horizontal) by 8 (vertical) character matrix. At this rate, you will get an average 30 line letter printed in only 28 seconds.

"NLQ" Mode

One of our highest concerns was about print quality and readability. The GP-550CD has a print mode termed Near Letter Quality printing (NLQ mode). This is where the GP-550CD outshines all the competition. Hands down! The character matrix in NLQ mode is a very dense 9 (horizontal) by 16 (vertical). This equates to 14,400 addressable dots per square inch. Now we're talking ***quality*** printing. You can even do graphics in the high resolution mode. The results are the best we've ever seen. The only other printers currently available having resolution this high go for $500 and more *without* the interface or cable needed to hook up to your Commodore!

Features That Won't Quit

With the GP-550CD your computer can now print 40, 48, 68, 80, 96, or 136 characters per line. You can print in ANY of 18 font styles. You not only have the standard Pica, Elite, Condensed and Italics, but also true Superscripts and Subscripts. Never again will you have to worry about how to print H_2O or X^2. This fantastic machine will do it automatically, through easy software commands right from your keyboard. All fonts have true descenders.

One of the fonts we like best is "Proportional" because it looks most like typesetting. The spacing for thin characters like "i" and "l" are given less space which "tightens" the word making reading easier and faster. This is only one example of the careful planning put into the GP-550CD.

Do you sometimes want to emphasize a word? It's easy, just use **bold** (double strike) to make the words stand out. Or, if you wish to be even more emphatic, underline the words. Or do both. You may also wish to "headline" a title. Each basic font has a corresponding elongated (double-wide) version. You can combine any of these modes to make the variation almost endless. Do you want to express something that you can't do with words? Use graphics with your text — even on the same line.

You can now do virtually any line spacing you want. You may select 6, 8, 7½ or 12 lines per inch. PLUS you have variable line spacing of 1.2 lines per inch to infinity (no space at all) and ***97*** other software selectable settings in between. You control line spacing on a dot-by-dot basis. If you've ever had a letter or other document that was just a few lines too long to fit a page, you can see how handy this feature is. Simply reduce the line spacing slightly and . . . VOILA! The letter now fits on one page.

Forms? Yes! Your Letterhead? Of Course!

Do you print forms? No problem. This unit will do them all. Any form up to 10 inches wide. The tractors are adjustable from 4½ to 10 inches. Yes, you can also use single sheets. Plain typing paper, your letterhead, short memo forms, anything you choose. Any size under 10" in width. Multiple copies? **Absolutely!** Put forms or individual sheets with carbons (up to 3 deep), and the last copy will be as readable as the first. Spread sheets with many columns? **Of course!** Just go to condensed mode printing and print a full 136 columns wide. Forget expensive wide-carriage printers and changing to wide carriage paper. You can now do it all on a standard 8½" page.

Consistent Print Quality

Most printers have a continuous loop ribbon cartridge or a single spool ribbon which gives nice dark printing when new, but quickly starts to fade after a while. To keep the printers' output looking consistently dark, the ribbons must be changed more often than is healthy for the pocketbook. The GP-550CD solves this problem completely by using a replaceable, inexpensive ink cassette which is separately replaceable from the actual ribbon. It keeps the ribbon loaded with ink at all times. You only replace the ribbon when it truly wears out, not when it starts to run low on ink. Just another example of the superb engineering applied to the GP-550CD. (When you finally do wear out your ribbon, replacement cost is only $10.95. Ink cassette replacement cost is only $5.95, both postpaid.)

The Best Part

When shopping for a quality printer with all these features, you could expect to pay around $500 or more. *Not any more!* We have done our homework. You don't have to worry about interfaces or cables. Everything is included. We are now able to sell this fantastic printer for **only $259.95!** The GP-550CD is built especially for the Commodore 64, VIC-20, Plus 4 and C-16. All Commodore graphics are included. This printer does everything the Commodore printers do but has more features. **You need absolutely nothing else to start printing –just add paper.** We also have specific models for other computers. Call for details.

No Risk Offer

We give you a 15-day satisfaction guarantee. If you are not completely satisfied for any reason we will refund the full purchase price. A 1-year warranty is included with your printer. The warranty repair policy is to repair or replace and reship to the buyer within 72 hours.

The Bottom Dollar

The GP-550CD is only $259.95. Shipping and insurance is $8.00 — UPS within the continental USA. If you are in a hurry, UPS Blue (second day air) is $18.00. Canada, Alaska, Mexico are $25.00 (air). Other foreign is $60.00 (air). California residents add 6% tax. These are cash prices — VISA and MC add 3% to total. We ship the next business day on money orders, cashiers' checks, and charge cards. A 14-day clearing period is required for checks.

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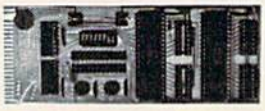

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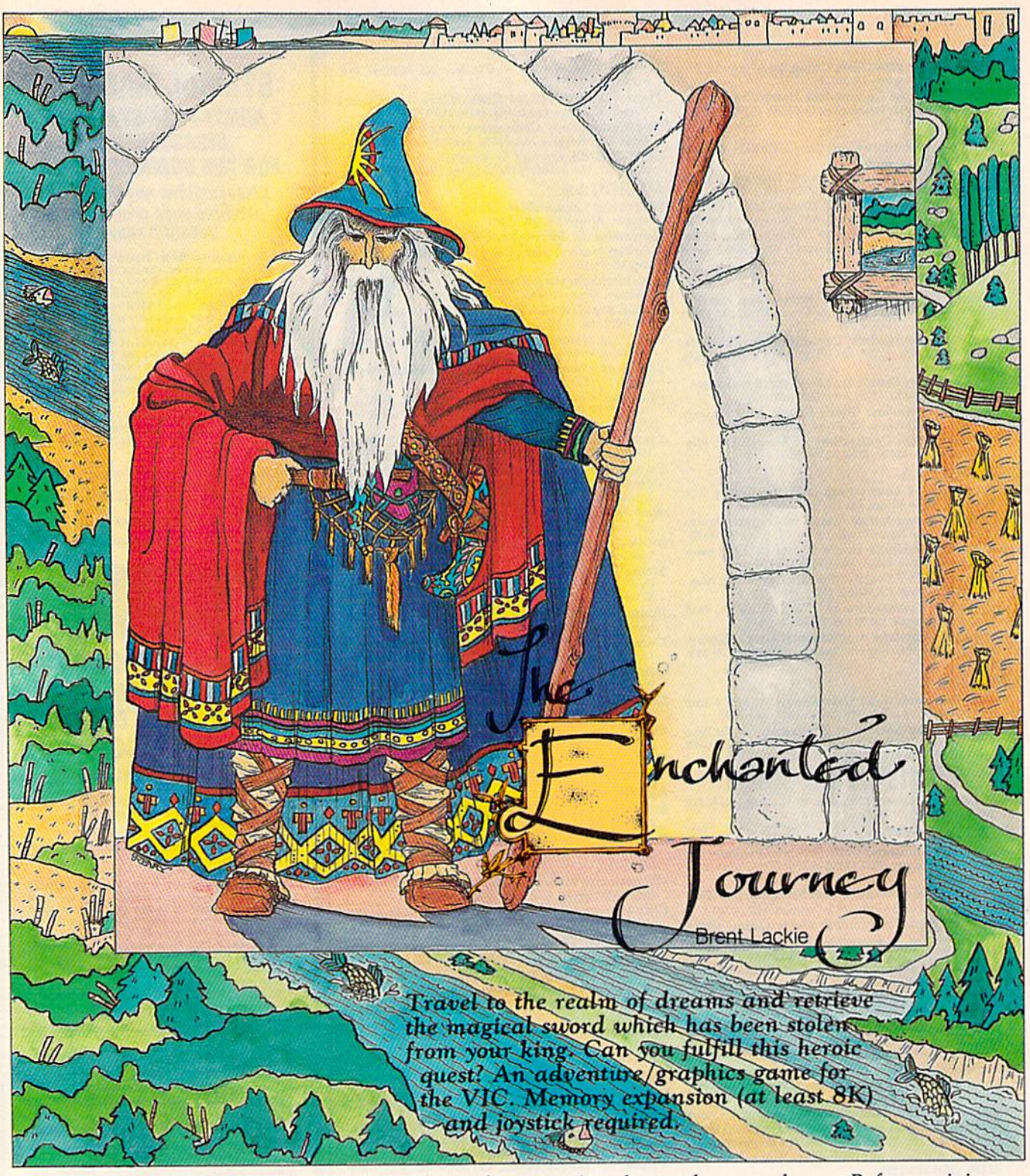

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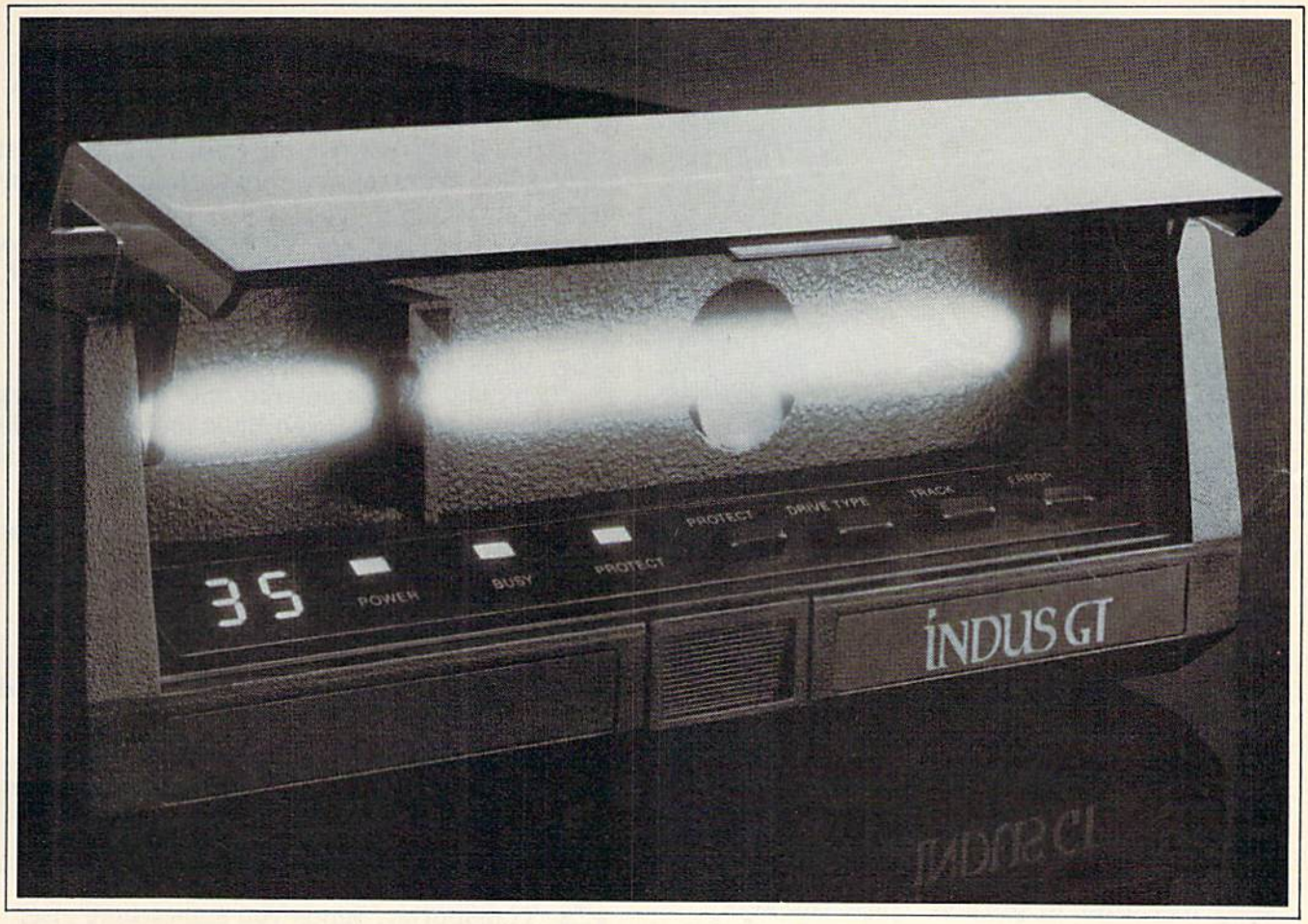
But this morning, you heard a knock at the door. Opening it revealed a wizard, wrapped in bright robes. He said that someone from the enchanted realm had stolen the king's magical sword. You, a brave and noble knight, have been chosen to get it back. Will you accept the quest?

To get to the enchanted land, you must swallow a potion that makes you dream. Before arriving there, you can equip yourself with one (or more) of these magical items which will aid you in your journey:

Boots Of Brickwalking. With these boots, you can walk through brick walls, but you cannot travel through brick from screen to screen.

Wand Of Secrets. Lights up any secret doors, which appear as asterisks (*).

Singing Globe. Helps you track down the lost sword. Each time you enter a new you hear a tone. The closer you are to the



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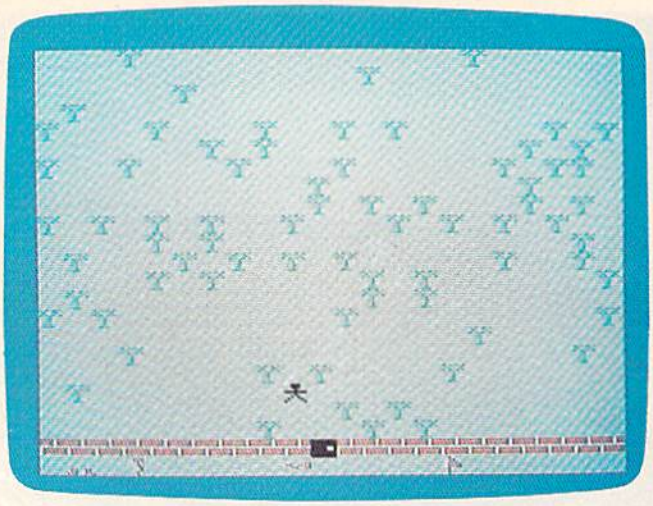

The player approaches a door leading into the castle.

sword, the higher the pitch.

Holy Cross. Keeps the undead away. Also allows you to walk past the deadly tombstones in the graveyard. If you press the fire button while the cross is in your possession, any monsters on the screen will freeze (can be used only once to freeze them).

Wand Of The Way. Lights up the cross, globe, boots, axe, and sword. Stops all illusions. See Tricks, Traps, And Monsters below.

Key (blue or purple). These two keys show you where to find certain keyholes attached to invisible doors.

Axe. Allows you to chop down trees which would otherwise block your path.

Torch. Disperses the palpable darkness which infests some areas.

At the beginning of the game, press f5 to see the menu of magical items, then a numbered key (1–9) to make a choice. Pressing zero (0) gives you one of the items at random. By using f5 again, you can pick another item. During the game, all items you have will appear at the bottom of the screen.

When you're ready to begin the quest, press f3 to be transported to a room or forest area at random. Or, use f1 to begin at a specific safe section of the forest. You have four chances (dream lives) to find the sword. If you fail, you can try again with four new lives.

Movement Through Forest And Castle

Use the joystick to move up, down, left, and right. Diagonal moves are not allowed. Pressing the fire button ends the game (unless you have the cross).

There are several dozen different screens. To pass from one to another, just move "off the screen." You cannot move through brick walls, unless you have the boots of brickwalking. Nor can you move through trees, unless you possess the axe.

You'll encounter two different terrains, forest and castle. Any area may contain treasures, monsters, or traps.

The forest areas are full of trees. If you move from one forest area to another, then travel back to the first, you'll notice that the trees have changed position. They migrate around the screen while you're not looking.

The castle can be entered only through marked doorways. Once inside, you must move from screen to screen using doors. Do not try to use the boots of brickwalking to move between screens.

Ordinary Door. Move your character into a door and then off the screen to use an ordinary door.

Secret Door. A secret door is an ordinary door that's hidden from sight. You won't see it and can't use it, unless you have the wand of secrets.

Keyhole For Invisible Door. You never see an invisible door, only the keyhole. If you are carrying the right key (purple key for purple door, blue for blue), the keyhole will be illuminated.

Transporter. Sends you somewhere else, but things may look a little strange, trees growing in a room for example.

Tricks, Traps, And Monsters

There are several magical items and creatures designed to thwart you and your quest.

The globe of lies looks like the singing globe, but leads you astray, away from the sword. You can get rid of it by finding the real globe or by having it stolen by a thief.

Cross-shaped tombstones are found in graveyards. Zombies usually inhabit the same area. Both are poisonous to the touch, unless you have the cross.

Certain rooms in the castle will shake violently, jarring loose massive bricks from the ceiling. If a brick hits you, you lose a life.

Some treasures may be visible, but are actually illusions, phantasms put there to fool you. The wand of the way lights up the real treasures and prevents you from being tricked.

Palpable darkness, or evil shadow, causes some areas to be impassable. You can't travel through a screen that is cursed with darkness. The torch disperses the shadow and allows you to pass through it.

Yellow disease affects your movement. Walk forward and you'll slide backward. Try to turn

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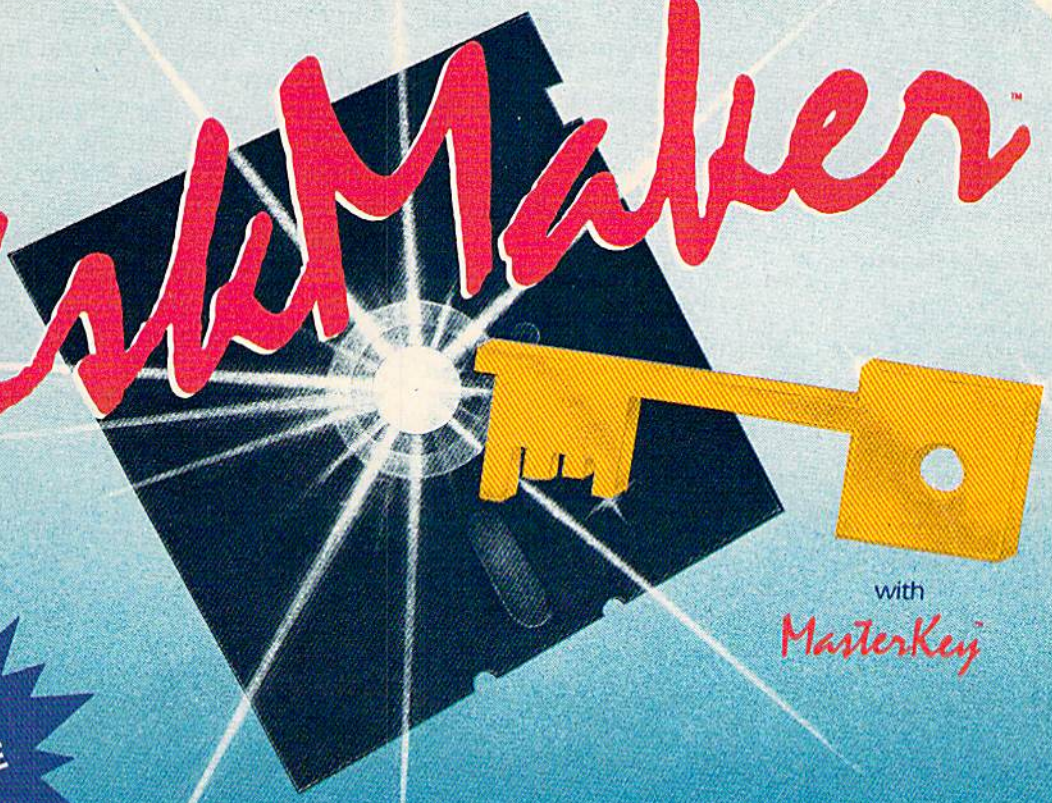

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left and you'll go right. There is no cure. And sometimes, despite your best efforts at making a map, you'll get lost in the forest.

There are also several creatures to avoid. Fluffers are round creatures with feet, found in groups of four. The Cheshire bobcat is almost invisible, but you can see two eyes and a large mouth. The boa constrictor brick monster tries to encircle you with brick walls (a good reason for owning boots of brickwalking). Thieves, out to steal one of your magical weapons, look like you, except they're blue. Zombies are red and are found in numbers in graveyards.

Finding The Sword

If you have the wand of the way, the sword will look like this:

Otherwise, it will appear as a question mark. There are also three deadly swords disguised as question marks. Thus, without the wand of the way, you have a 25 percent chance of picking the right sword. But, once you capture it, you'll be magically transported out of the enchanted land. The king's wizard will congratulate you on a job well done.

Typing Instructions

Follow these important instructions to make sure the programs are entered correctly.

Insert an 8K expander (16K or 24K will also work). The program requires at least 8K. Enter Program 1, which raises the start of memory to make room for custom characters. Pay close attention to line 4, which loads Program 2. The line under the letter O at the beginning indicates that you should type SHIFT-O (L SHIFT-O is the abbreviation for LOAD). Also, in line 4, tape users should replace the 8 (the disk drive device number) with a 1. Then save to disk or tape.

Next, type NEW and enter Program 2, which creates the custom characters. Line 9 loads the next program and, as before, the underlined O means SHIFT-O. Again, tape users should replace the 8 with a 1, in line 9.

When saving program two, use the program name "Y". Line 4 of Program 1 loads and runs "Y" after it's done. Likewise, Program 2 loads and runs "Z", the name you should use when saving program three.

Tape users should save Programs 1, 2, and 3 one after another on a single tape. To play the game, load and run the first program.

See program listings on page 141.

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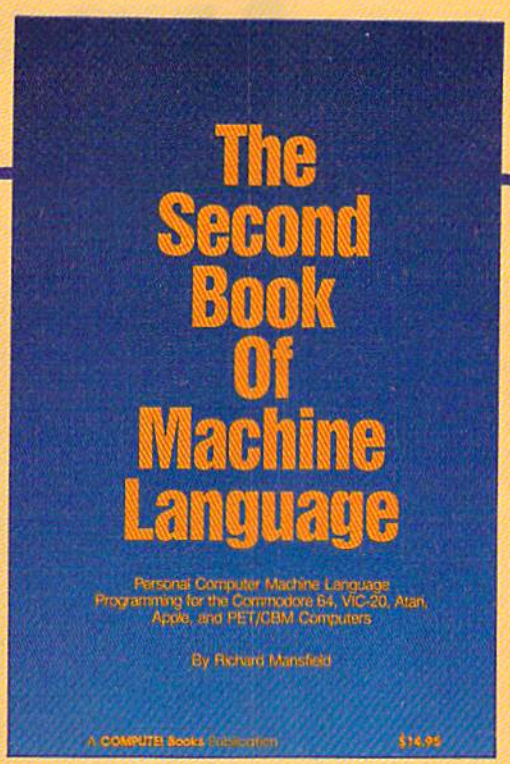
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John Matias

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They told you it would be easy, farming on the planet Scelor. All you'd have to do is direct the agribots to plant the seeds in the spring and harvest the valuable crop in the autumn. There are no aliens within hundreds of light years, they said. As the shuttle pilot dropped you off, she wished you good luck.

You're going to need good luck.

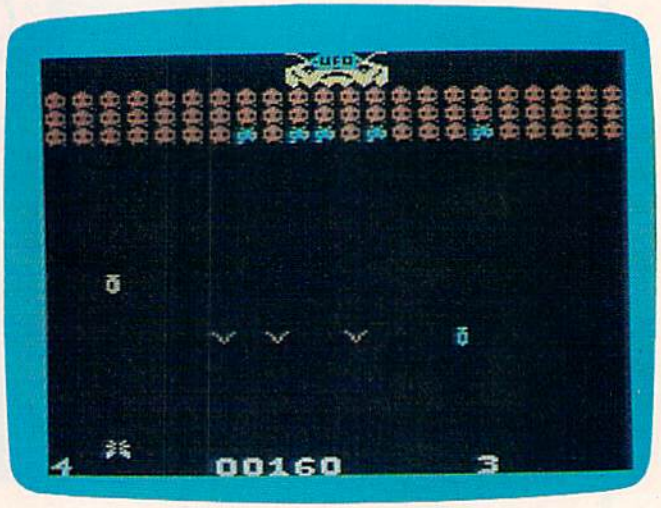
The day after you landed, the aliens came. First the mothership, which apparently opened up a space warp from another dimension. Then, row after row of menacing droids. Thinking quickly, you equipped each of your robots with a laser to send the invaders back to their own dimension.

The droids don't actually attack you; they simply hover in the sky, waiting to land. But they drop smartbombs, which are impervious to lasers. Your only defense is to move out of the way. The mothership also releases birds that home in on your robots. As the birds descend, they drop slow-moving bombs. Fortunately, you *can* shoot the birds and their bombs.

Your ultimate goal in "Alien Armada" is to get to the source of the invading aliens: the ominous mothership. If you can hit it with a single laser shot, you'll send it (and the droids) back to its own dimension. But it's not an easy task. You must first eliminate the droids who guard the mothership. Each changes three times before being sent back home.

VIC Notes

Alien Armada has ten skill levels, 0 (the easiest) through 9 (the hardest). In levels 0–4, you have six robots, and the birds move slowly. In levels 5–9, you have only three ships and the birds are faster. Scoring is as follows:



Deadly smartbombs, slow bombs, and birds descend continously (VIC version).

smartbombs	**0 points (cannot be shot)**
slow bombs	**10 points**
aliens	**10 points**
birds	**100 points**
mothership	**2000–5000 points**

If you reach 10,000 points, the aliens get angry and the pace quickens.

Typing In The VIC Version

The VIC version runs without memory expansion, but you'll need at least 8K memory expansion to enter it. First, type in Program 1 (with or without expansion) and save it. If you're using tape, change line 460 to:

```
460 LOAD"AA",1,1:END
```

Program 2 requires VIC MLX (published periodically in the GAZETTE). Follow these steps:

1. After saving Program 1, turn off the VIC and insert the memory expansion (8K or more).
2. Enter **POKE642,32:SYS58232**.
3. Load and run MLX.
4. Enter a starting address of 4097, ending address 7030.

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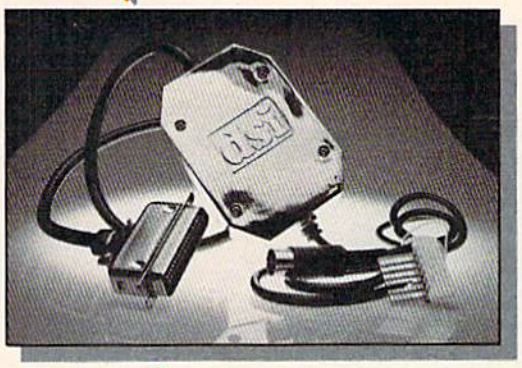

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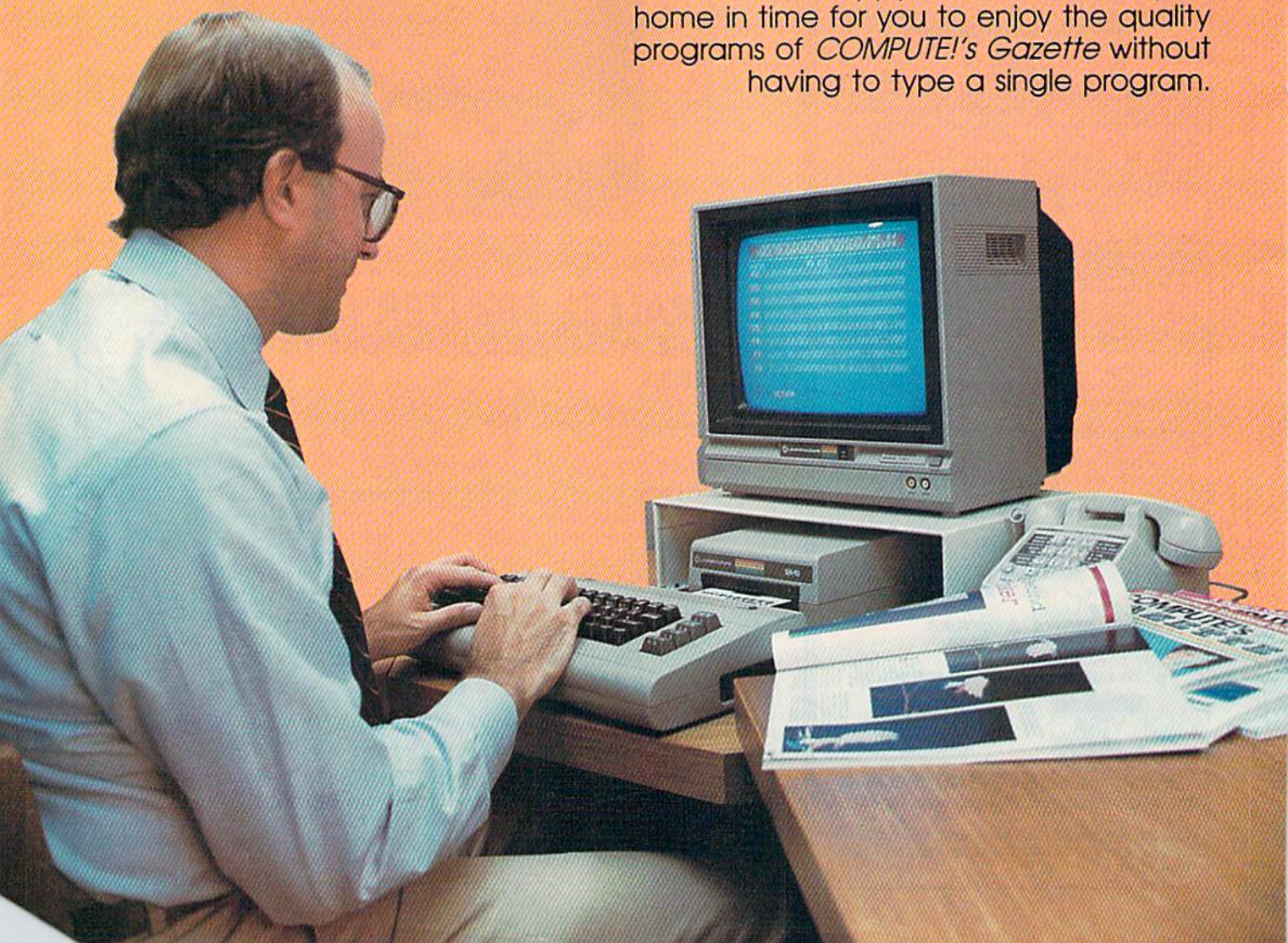

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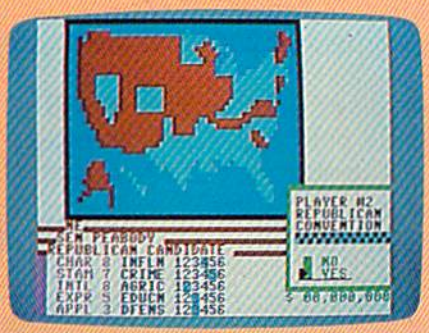

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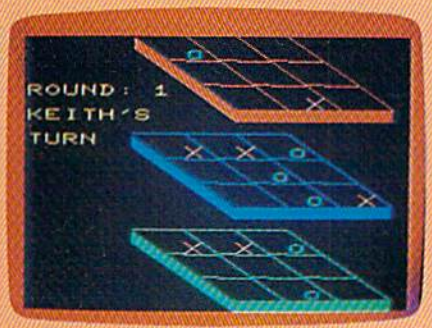

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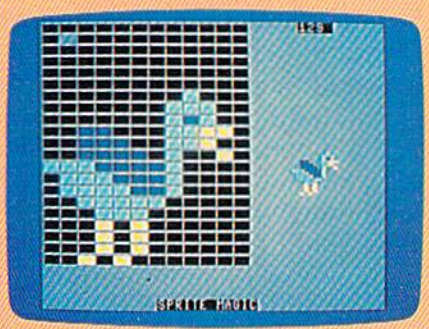

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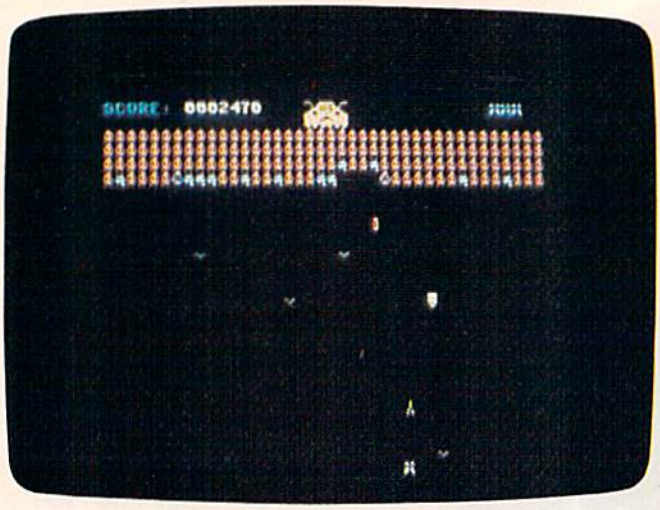

A laser is fired at the rows of droids in hope of getting to the mothership (64 version).

5. Type in Program 2 and save it with the filename "AA". (If you're using a cassette drive, be sure to save Program 2 immediately after Program 1.)
6. After both programs are typed and saved, turn off your VIC, remove the memory expansion, load Program 1, then type RUN. It will automatically load Program 2. Screen instructions will prompt you when the program first appears on your screen.

64 Notes

The 64 version contains some minor differences. You must break through four rows of aliens (there are three in the VIC version); levels 0–4 give you five lives (versus six in the VIC version); and the high score is displayed. Also, the 64 version has a pause feature which is toggled on and off with the SHIFT/LOCK key.

Scoring is as follows:

aliens	**50 points**
birds	**50 points**
bombs	**100 points**
mothership	**2000–5000 points**

The 64 version is all machine language and requires MLX to type it in. Follow these steps:

1. First, enter **POKE642,20:SYS58260**.
2. Load and run MLX.
3. Enter a starting address of 2049 and an ending address of 4424.
4. After saving to tape or disk, turn the 64 off and on (to reset some pointers). Load the program and type RUN to start it. The joystick must be in port 2.

See program listings on page 133.

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How fast can you think? This challenging game will put your brain to the test. It can be played just for fun or in competition with up to six players. Originally written for the 64, we've added a version for the VIC (at least 8K expansion required).

OK, the word is VEGETABLE. How many other words can you make from VEGETABLE in less than two minutes? Let's see, there's TABLE, GET, BAT, and BALE, to name just a few. "Charlemagne's Sword" is different every time it's played. "Vegetable" is one of 30 words in the program's vocabulary (but more can be easily added). At the beginning of each game, you're asked to choose the number of players, then "Words" or "Dice." While "Words" selects one of the 30 vocabulary words, "Dice" chooses nine random letters, including at least two vowels.

The Longer, The Better

The longer your words, the more points you earn. A good strategy is to quickly enter short, more obvious words, like "no," "at," or "is," then hunt for longer words, like "table" or "gavel" from our example above. When the game begins, don't hesitate. Press RETURN after each word is typed. Illegal letters (those not in the word or letters you're working from) are not accepted.

But don't spend too much time thinking. You have to watch the timer at the bottom of the screen. When 12 seconds remain, the screen flashes as a reminder that you need to hurry.

When the time is up, the screen prompts for "Any Challenges (Y/N)?" If another player suspects an illegal entry, the word in question must be verified. (A dictionary or group consensus can serve as arbitrator.) Press Y, then respond to the prompt "Which Word?" by typing in the suspect word. A prompt then asks if the challenge is correct. If so, the word is discounted. If not, another prompt for challenges is offered. When all players are satisfied with the entries, a score is given. Points are cumulative, so any number of rounds can be played in one game.

If more than one player is involved, the program cycles to the second player and so on. Once through the cycle, the first player may start another round or end the game by typing a back arrow (a prompt is displayed to remind you of this choice).

After several games, you may wish to add to or replace new words in the program's vocabulary. This can be done by changing the words in the DATA statements at the end of the program. If you add new words, the value of S$ in line 80 must reflect the new total, and the number 30 in lines 90 and 780 (line 770, VIC version) must also be changed accordingly.

1541 FLASH!™— THE CRITICS SPEAK OUT

This advertisement has been written by independent reviewers of Commodore computer products. We thank them for their frankness and the high marks awarded to the Skyles Electric Works **1541 FLASH!**.

The Reviewers Comment

"Tired of that slow disk drive? The solution is here, and it costs about $90. Considering what it does, the price is a bargain! It speeds up your 1541 disk drive 200%–300%. And if you write your own software specially for the **FLASH!**, you can achieve speed increases of 600%!

The **1541 FLASH!** is the best! It's better than KWIK LOAD!™ And better than 1541 Express.™

Does it sound too good to be true? Do you suspect there must be some drawback that I haven't mentioned? Well... There is one. You have to open up your keyboard and 1541 drive and do a little work inside them. You need to replace a couple of chips with new ones provided by the **FLASH!**. And an extra cable will run from your keyboard's user port to your 1541 drive. But the installation is explained in complete detail with pictures. It's a simple operation that will take under 30 minutes. And in return you will have a disk drive that literally races along!

The biggest complaint with the Commodore 64 is the slow disk drive. No more! You will never be willing to go back after having used the **1541 FLASH!**. It really spoils you! It's even faster than a parallel drive with an IEEE interface! Don't be afraid of the installation. It's really simple. And if you prefer not to do it yourself, your local user's group probably has people with the ability to install it for you. You'll be glad you did!"

The Northwest Users Guide, Jan. 1985

"A tiny wedge is included... you simply SYS65526 to enable it. Those who enjoy using the wedge as part of their normal computer will like this feature.

The utilities added by **FLASH!** include single, double and simultaneous keystroke implementation of such niceties as delete line, escape quote, cursor to bottom of screen, 16 character tab, and return without line execution.

My children have played some of their favorite games and used utilities or educational software without any problems whatsoever, using the **1541 FLASH!** All in all, this device will save the purchaser much of the frustration normally experienced, as well as the time required in normal disk drive-computer interactions. With the above noted exception, I'm very pleased with its operation, and won't hesitate to recommend it to those who would like faster loads and saves or want additional flexibility and power at a moderate price."

RUN, May 1985

"Having used **1541 FLASH!** for several days, already I can't bear to go back to a slow 1541. It's amazing how quickly you can get spoiled by a luxury like this. More than a few editors here have cast covetous eyes on the upgraded 64/1541. And the price is reasonable for such a dramatic enhancement. After reading the installation description above, you can decide if you're up to opening your equipment, yanking out chips, and enjoying a 300% speedup."

Compute!'s Gazette, Jan. 1985

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This player has nine words to his credit and a lot of time remaining (VIC version).

Longer words have earned more points for player 2 (64 version).

If you find the games too uneven, with one player winning too often, Charlemagne's Sword can be modified. Line 100 gives 1.41 handicapping points to each player. These points determine the score for each word using the formula INT(1.41↑J), where J is the length of the word. A four-letter word, for example, gives you three points, while a five letter word is worth five. To adjust the handicap for individual players, you could add a line 105 HC(1)=1.51, which would give player 1 a scoring advantage (a four-letter word for player 1 would now score five points, a five-letter word seven). Raising the handicap to three would score a whopping 81 points for four letters, 243 for five letters. Lowering it to one means all words are worth one point, regardless of length. Changing the handicap can make a game between an adult and a child more of a contest.

See program listings on page 123.

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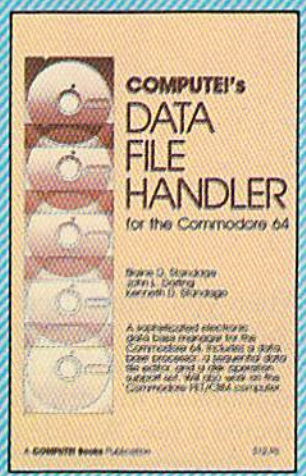

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Blaine D. Standage, John L. Darling, Kenneth D. Standage

Data File Handler is a series of integrated programs that give the user a database processor, a sequential data file editor, and a disk operation support set. The book consists of all the necessary program listings and documentation to use this powerful database management system. Few computer programs are as well-explained or as cost-effective as this one. Anyone who wants an effective information management system for their Commodore 64 or PET/CBM will find this an extraordinary software/documentation package.

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Programming the Commodore 64: The Definitive Guide

Raeto Collin West

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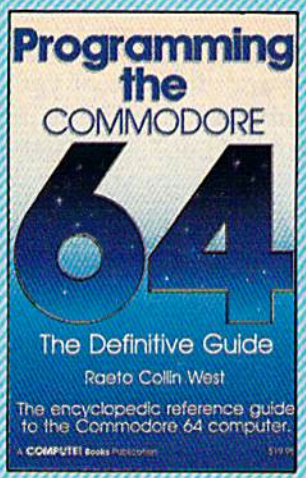

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Jogger's Log

Ronald C. Pacanowski

This combination database and analysis program will help manage and analyze jogging records. Originally written for the VIC-20 with 3K or more memory expansion, we've added a version for the 64. A disk drive is required.

If you're a jogger, you know that keeping track of the time and distance of your runs helps monitor your progress, and helps in setting new goals. "Jogger's Log" is a database which does all the recordkeeping for you.

If you're not a jogger, the program is written in BASIC and can be easily modified to suit most any endeavor where recordkeeping is an aid. The following discussion will help in understanding how the program is constructed.

A Menu-Driven Database

Data is stored on disk using random access fixed length records of 256 bytes each. This means that a disk will hold about 600 records. A sequential index file is used to keep account of which tracks and sectors have been used to store data. Remember the advice of the disk drive manual that a disk containing random access files should *never* be validated.

The program begins by asking for the maximum number of runs you intend to enter. Then the main menu appears. The menu options allow you to create a new database, add a record (run) to an existing database, modify or delete a record in an existing database, or display the information stored in the database.

Press the appropriate letter to select an option. (The menu fully appears the first time the program is run. When you return to the menu after your initial choice, you'll see CAMDSX. This is an abbreviated menu, which is used to save time. It corresponds to the original full-screen menu. C creates a file, A adds a record, M modifies a record, D deletes a record, S shows a record, and X exits the program.)

Operation

Let's say you've decided to name the database MY LOG and entered C to create it. You must now enter data for run 1. The three mandatory items are the *date*, *distance*, and elapsed *time* of the run. Optionally, there is one category to describe the running *route* and another for any *comments* you might make. It's important to enter each in the correct form. The *date* must be exactly six digits long, with the two digit month followed by the two digit day, followed by the last two digits of the year. The format is MMDDYY. For instance, if the run was on Dec 9, 1984, the entry should be 120984.

Distance is recorded in miles, to the hundredth of a mile. *Time* is expected to be exactly six digits in the format HHMMSS. This means a time of one hour, two minutes, and six seconds is entered as 010206. Both the *route* and *comments* categories must be less than 88 characters in length (less than 80 characters in the 64 version). Also avoid using commas in your route description or comments. Use dashes, periods, or other characters acceptable to the INPUT statement. A typical *route* might be: DOWN MAIN ST. TO EAST RD./UP THE HILL & BACK. The *comment* field is useful for noting things like temperature, humidity, pulse, starting time, type of run, etc. If you don't care to add a *route* description or *comments*, just press RETURN when prompted for these entries.

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After you've responded to the five categories, you're asked if there is data for another run. The default is Y for yes. Press RETURN and the input sequence repeats for the second run. When finished, type N and the main menu reappears.

To modify the data on a particular run, enter M, the database name, and the run number. The appropriate data will be brought onto the screen. Following the new menu allows you to change any or all categories for that particular run. When you're finished making corrections, RETURN takes you back to the main menu. Deleting a run or adding runs to an existing database are done similarly, by following the menus. Multiple databases are also possible on the same disk as long as each has a distinct name.

Now that you know how to create and maintain a database, here's how to display its contents. Enter S (for show) in the main menu. This will bring up the selection menu. Here we are relating a category (*date*, *time*, etc.), logical operation (Equal, Less Than, etc.), and a value. For example, suppose you wanted to consider only those runs where the *distance* was greater than 3.25 miles. Enter 2,GT,3.25. You are then asked for another selection. If you enter 1,LT,011785, then all runs greater than 3.25 miles and before the date of January 17, 1985 will be considered. If we don't want to specify any selectivity we just enter RETURN. The allowed logical operations are: EQ (EQual), NE (Not Equal), GT (Greater Than), LT (Less Than), GE (Greater than or Equal), and LE (Less than or Equal).

Next you are asked if you want a listing, pace calculation, or a graph of the mileage. These results will be displayed on the screen. (An option for printer output is not included but should not be difficult to add.) The list, pace, and graph options sift through the database and retrieve only those runs which meet the previously specified selection criteria. You can page through the listing by entering RETURN. This allows you to easily review what information has been stored.

The pace option displays the mileage and average pace. A 7:20 means a seven minute, twenty second per mile pace. It also displays weekly mileage and average weekly pace. After every week the display stops until RETURN is pressed. When using the graph option, you are asked for some scaling information. The graph of mileage is plotted by printing one line of asterisks across the screen for each run that was specified. Each asterisk corresponds to a certain amount of mileage, and days without runs are noted by a zero followed by a blank line. Letting one asterisk equal .5 miles works well for distances up to around ten miles (when used with the VIC's 22-column screen—64 owners might try .25 miles per asterisk). Again a RETURN will continue the graph.

When a list, pace, or graph option is completed, the main menu will reappear. To exit the program, use the X option. *Note: Stopping the program by using the* RUN/STOP–RESTORE *keys anywhere but at the main menu may render your database unreadable.*

Suggestions To Users

After carefully typing the program in, save it, put a newly formatted disk into the drive, and run the program. The listing should be understandable with a little effort. Generous use of subroutines is made to keep the program length as minimal as possible. This also makes it easy to lift out the database routines for use in other programs. When doing this, remember the fundamental restriction is that the records are fixed at 256 bytes each. More categories can be added as long as the total length of the record doesn't exceed 256 characters. Sorting has not been included here because it is natural to consider runs chronologically. Adding a sort option is not difficult, but remember to sort the sequential index file rather than the database itself.

(See program listings on page 130.)

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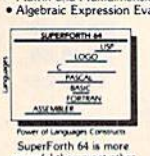

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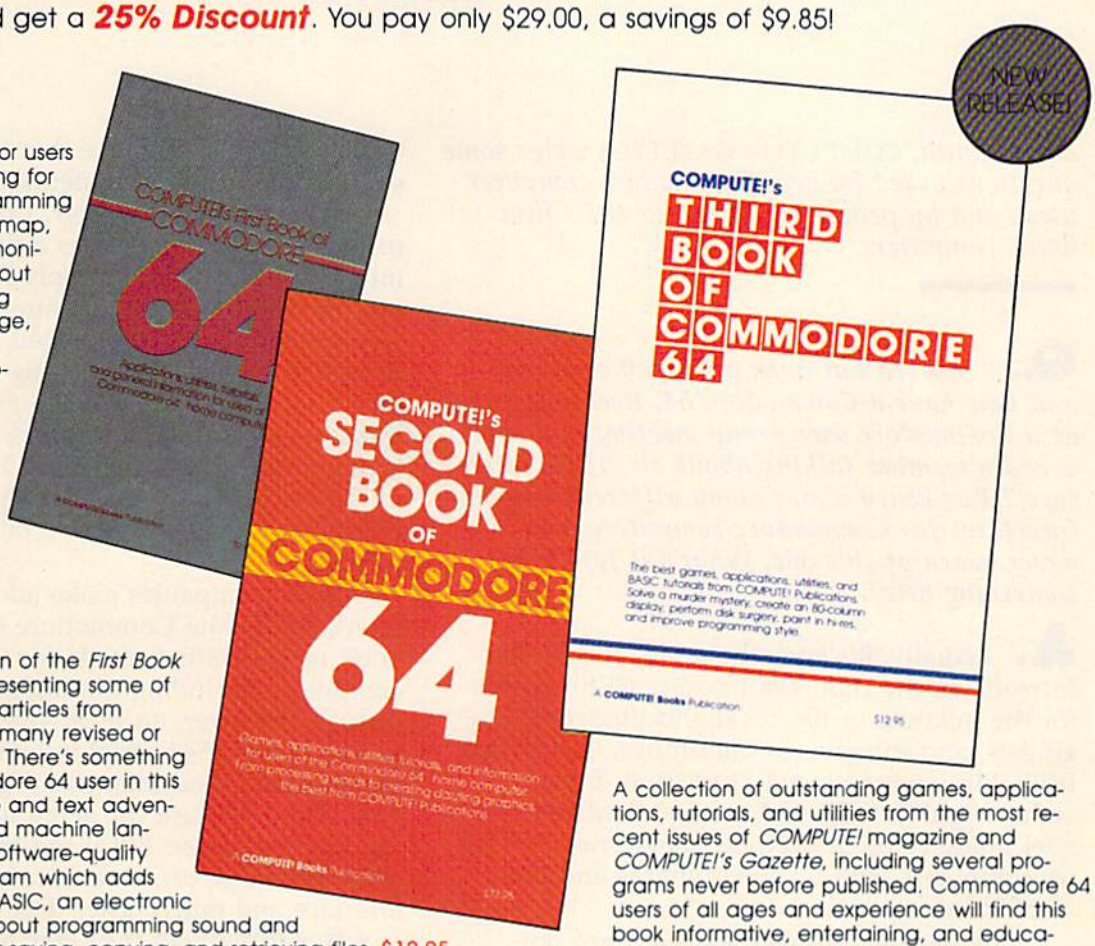
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SIMPLE ANSWERS TO COMMON QUESTIONS

Tom R. Halfhill, Staff Editor

Q A

Each month, COMPUTE!'s GAZETTE *tackles some questions asked by new Commodore computer users and by people shopping for their first home computer.*

Q. ***I started out with a VIC-20 computer and now have a Commodore 64. Recently I was at a Commodore user group meeting and overheard a member talking about an "IEEE interface." I've heard about many different kinds of interfaces for Commodore computers, but I never heard of this one. What's it for? Is it something new?***

A. Actually, it's something old. It is known formally as the *IEEE-488 interface* (IEEE stands for the Institute of Electrical and Electronic Engineers, and to reduce a mouthful to a bite-size, IEEE-488 is pronounced "Eye triple-E four eighty-eight"). IEEE-488 is a standardized parallel interface often used in laboratories to hook up computers with test instruments and other electrical equipment.

The person you overheard at the Commodore meeting was probably an old-timer (in personal computing terms, that is). The IEEE-488 interface dates back to the days of the Commodore PET, the computer which preceded the VIC-20 and 64. First introduced in 1977, the original PET had 8K of Random Access Memory, a built-in monitor screen and tape drive, 40-column screen format, and no color or sound (except tones and beeps). It also had a built-in IEEE-488 interface.

Why such an odd interface? Because the PET was designed as a general-purpose personal computer at a time when home computing was still a dream. With an IEEE-488 port, it was readily adapted to scientific and technical work. Available for only $795—an amazing value in those days—the PET was an inexpensive way for a company to computerize its equipment lab. Electronic hobbyists, too, appreciated a computer with a standard interface that worked with their sophisticated test instruments.

A couple of years later, Commodore began using the IEEE-488 port as a floppy disk drive interface (until then, the only mass storage device available was the cassette recorder). The Commodore 2031, 2040, 4040, 8050, and 8250 drives all are designed to plug into the IEEE-488 port. Since the IEEE-488 is a *parallel* interface (it transmits eight bits of information at a time), it's actually much faster than the 1541 disk drive interfaces found on the VIC and 64 (whose *serial* interfaces transmit only one bit of information at a time).

Some companies make add-on IEEE-488 interfaces for the Commodore 64 so you can hook up disk drives made for the PET series computers (including the high-density dual drives). However, an IEEE-488 adapter that attaches to the 1541 serial interface won't deliver much more speed than you'd get with a regular 1541 drive because the serial interface remains the limiting factor. But if the adapter plugs into the expansion port, it can provide a true parallel interface and much faster disk access.

In addition, an IEEE-488 adapter lets you connect a Commodore 64 to some special electronic equipment for scientific and technical applications.

Q. ***I read about the new fast disk drive introduced for the Commodore Plus/4 computer. Is it really much faster than a 1541? And is there any way to make it work with a VIC or 64?***

A. The new disk drive—which Commodore announced last year as the SFS-481 and recently renamed the 1551—is indeed significantly faster than the 1541. Why? For the same reason that an IEEE-488 drive is faster than a 1541: It's a case of parallel versus serial (see above). Besides the usual serial interface found on the VIC and 64, the Plus/4 also has a parallel interface specially designed for the 1551. All other factors being

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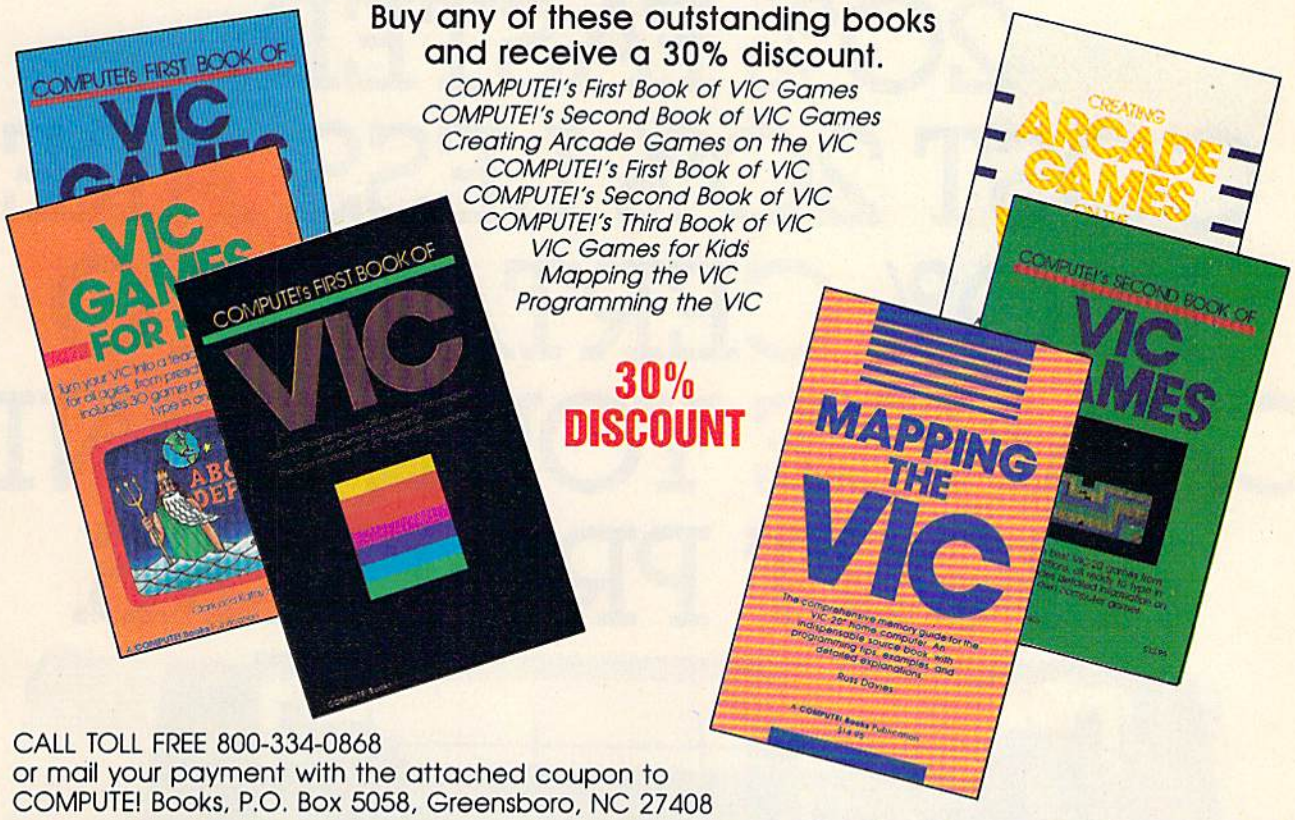

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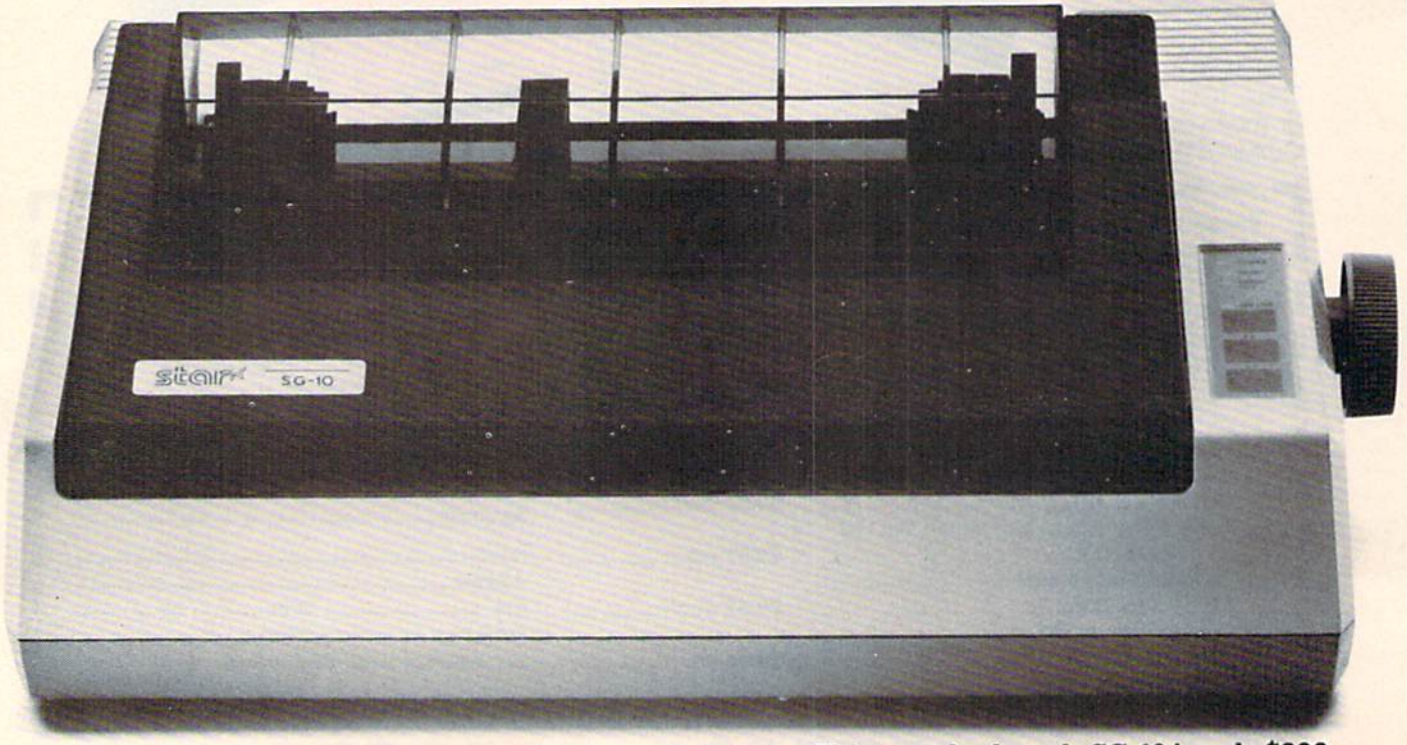

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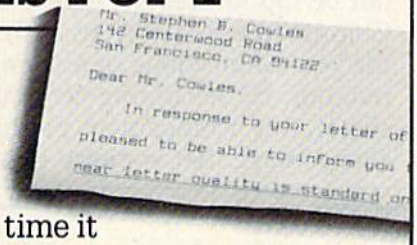
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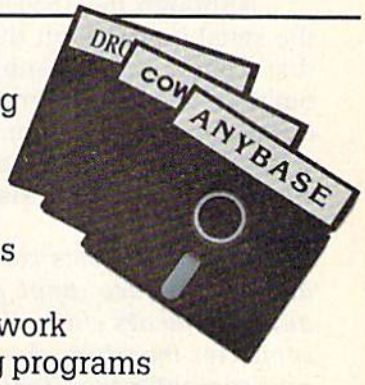

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equal, a parallel interface can send and receive data up to eight times faster than its serial counterpart.

At this writing, production models of the 1551 are not yet available, so we haven't tested the new drive to see exactly *how* fast it is. However, we have used prototypes at computer trade shows and observed that they are noticeably faster than 1541s.

Although the 1551 is not compatible with the serial interface on the VIC or 64, it's possible that Commodore or another company could build an adapter to connect the new drive to the expansion port. Like the IEEE-488 adapter described above, a 1551 adapter could add parallel-speed disk access to existing VICs and 64s.

Q. ***Some TV sets coming out lately have audio and video input jacks on the back. The advertisements claim these TVs can be used as computer monitors. Are they really as good as a real computer monitor?***

A. They're very close. Simply speaking, the video input jack bypasses the TV tuner circuitry and feeds the incoming video signal directly to the picture tube. (The jack can accept video signals from a home computer, a videogame machine, a videocassette recorder, or a videodisc player.) Bypassing the tuner circuitry nearly always results in a much sharper image than when the computer is connected to the antenna terminals.

Here's why: When you hook up a computer to antenna terminals, the TV is expecting to receive a signal which resembles a normal broadcast transmission. So the computer simulates a broadcast by converting its pure video signal with a device called an *RF* (radio frequency) *modulator.* When the TV receives the RF-modulated output through its antenna connections, it treats the signal like a regular broadcast. The TV tuner section converts the signal back into the original video and feeds it to the picture tube. Inevitably, some quality is lost during this double conversion process—a process that is eliminated when you tap into a TV's video input jack.

Because the circuitry of a computer monitor can be optimized in various ways for computer use, it's still superior to a TV set with video inputs. In practice, however, the difference may not be too noticeable. One exception is when a Commodore 64 (or Atari 800) is hooked up to the *rear* connections of a Commodore 1701/1702 monitor. By separating certain parts of the video signal, this arrangement produces an extremely sharp image that is pretty hard to beat.

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The Cosmic Balance

"Captain, a Brotherhood dreadnought approaches us at 32 degrees. They've launched a plasma torpedo. What are your orders?"

"We'll meet them head on. Bump velocity to six and wait a couple of seconds before changing bearing to 33. Energize all belts, full power to shields. Arm weapons, fire at optimum time. Launch a fighter group. Hold it—on second thought, cancel the fighters. If we smash their shields, send a boarding party of marines. Maybe we can capture their ship without much of a fight."

In this game for the 64 from Strategic Simulations Inc. (SSI), you control one or more starships in tactical combat against enemy vessels. The many options may seem daunting at first, but as you gain experience in battle, you learn to appreciate the subtleties of *The Cosmic Balance*.

First, you choose either to start a new game or to recall one you've saved to disk. You can opt for two players or one (you against the computer, with four difficulty levels). Finally, you choose which of the six scenarios you'll play.

Some scenarios are simpler than others, and can be played fairly quickly (30–60 minutes). Others take time, especially if you have to keep track of several ships. Each game has its own victory conditions, goals you must attempt to reach. In five of the six scenarios, you have to build ships from scratch (or recall a previously built ship from disk).

Choose a technology level and a ship size (from the tiny Corvette to the huge Dreadnought). You're tempted at first to build vessels with lots of firepower. But in practice, a heavily armed ship with no defense is a sitting duck.

You begin with a shell and a limited amount of space for offensive and defensive weapons. There are a few necessities you should install first: engines (for power), drives (for moving the ship), and defensive shields.

If you give your crew extra room for eating, sleeping, and living, they'll be happier. Hull space translates to crew efficiency, although it means you have less space for things like weapons, drives, and engines.

Six different weapons are available: light phasers, heavy phasers, siege phasers, photon torpedoes, disruptors, and plasma torpedoes. There are also several guided missiles: light seekers, heavy seekers, and fighter groups. Fighter groups take up much space. But they swarm like bees and cause lots of damage. Other items include range (warp drives), cargo holds (required in certain scenarios), marines and transporters, armor, belts, and tractor beams.

When you're finished creating ships, you can save them to disk.

Now the battle begins. Each turn has two parts: Orders and Execution. In the Orders phase you can change speed or bearing, arm and fire weapons, launch guided missiles, repair shields, jam their radar, send a boarding party of marines, and much more. Two high-resolution maps allow you to plot your course and identify other ships in the sector.

As the game proceeds and your ship is battered by phasers, torpedoes, and guided missiles, you may find yourself losing engines and running out of energy. As a last resort, you can drain energy from the shields. This weakens your defense, but gives you power for weapons and drives.

After all orders are given, the execution phase begins. The ships fly around the screen, launching different types of weapons. If a weapon hits, you're told how much damage occurred.

You then go on to the next round, giving more orders and watching the results. Some games end after ten turns; others have no time limit. If you're losing and have some warp drives (range) remaining, you can warp out, ending the game. You then learn who won the battle.

The first few games you

play against the computer will be routs, utter disasters (unless you deliberately give the computer a dog of a ship). The computer player will fly rings around you. By studying its moves, you'll learn something about captaining a spaceship and how to design effectively.

Despite some very minor bugs in the program and omissions in the instructions, this game is great fun to play. It's difficult to master, and remains a challenge even as you gain experience.

—Todd Heimarck

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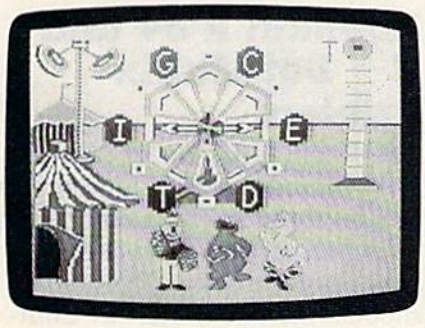
Letter-Go-Round

A lot of educational programs for preschoolers are cumbersome or presume too much of the child. Some, which are otherwise good, are too slow—unappealing to an age group in which the attention span is short. But as more educational software for the Commodore 64 has developed over the past year, the parent or teacher has more and better choices.

Letter-Go-Round, developed by the Children's Television Workshop and published by CBS Software, is an outstanding choice for teaching early reading skills. It's also highly entertaining. Featuring five famous Sesame Street characters (Big Bird, Bert, Cookie Monster, Barkley, and Grover), the program is designed for children ages three to six. The package includes "EasyKey," a vinyl (easy to clean) keyboard overlay which simplifies matters for the child.

The program offers six levels which collectively teach letter recognition and matching, upper- and lowercase matching, word recognition, and simple spelling. The screen scenario, an appealing high-resolution rendering of a circus, is the same for all levels. At the center is the "letter-go-round," which looks like a ferris wheel. At each level, one of the Sesame

Street characters (selected by the child) brings out the props—for example, Cookie Monster might bring out B, A, and a blank. The letter-go-round, containing perhaps a J, D, W, T, S, or X, spins, and when an appropriate letter (D or T is acceptable in this example) reaches the bottom, STOP on the overlay is pressed to halt the ferris wheel and drop the letter into place. After a correct answer, a segment of the "strength-o-meter" (a tower with a bell on top) is built. Then the Sesame Street character returns to a tent and brings out a new set of props. After the tower is complete, the strength-o-meter bell is rung and Big Bird, Bert, and Cookie Monster come out and dance a little jig to some delightful music, thus ending play on that level. A new level may then be selected.



A number of thoughtful extras have been added to give the program more value as an educational tool. On the overlay, the pictures of a rabbit and turtle can be pressed for a fast or slow ferris wheel. A Pause button is included here also. The levels on the main menu range from easy (Upper Case Matching) to hard (Spell the Secret Word), but by pushing the Level button, you can select any one.

There are no penalties for wrong key presses or choices. If a child matches an uppercase

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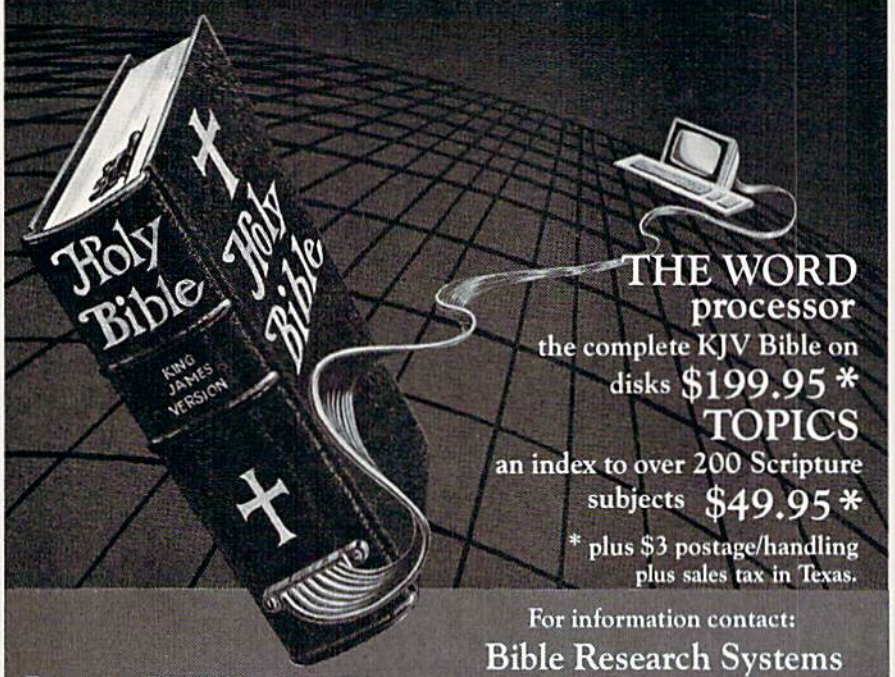

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"A" with a lowercase "m," for example, the inappropriate letter is returned to the ferris wheel and it resumes spinning.

Excellent high-resolution graphics, good animation, and superb music (including the Sesame Street theme song) give the program added appeal. The manual is thorough and includes a number of suggestions for parents to assist their youngsters in using the program effectively. Also included in the manual is a story and several activities for children.

Letter-Go-Round is another outstanding product from Children's Television Workshop.

—Lance Elko

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Riteman R 64 and C+ Dot-Matrix Printers

The Riteman family of printers has entered the fray, jumping in amidst the numerous companies trying to capitalize on the low-cost printer market. Riteman's models include a built-in Commodore serial interface; you don't need to buy a special interface cartridge. They also offer full MPS-801/1525 compatibility. That means that you can run programs written for the MPS-801 printer, yet take advantage of the extra speed and bonus features of these printers.

The Riteman R 64 is the more expensive printer. It's quite attractive, looking like a slenderized and streamlined Epson MX-80. A special tiny ribbon cartridge is used, and the printer can feed either pinfeed

or single-sheet paper. It prints bidirectionally at 120 characters per second. Epson MX-80-compatible printing modes include double strike, emphasized, compressed, underlining, super- and subscripts, italics, double-width, and high-density graphics mode. It can print either 40, 66, 80, or 132 characters per line. The characters are well-formed within a 9 × 9 matrix, with full lowercase descenders. The built-in Commodore interface adds the full set of Commodore graphics, true reverse-field printing, listing mode (where cursor and color controls are spelled out) and MPS-801 features like programmable tab stops. A bonus: The Riteman R 64 also includes a Centronics parallel interface, so you can use this printer with other computers, such as the Apple, Atari, and IBM PC, and it should work with the next computer you buy, provided it has a Centronics parallel printer interface.

The Riteman C+ printer shares most of the features of the R 64, except for listing mode. It works only with the Commodore serial port, lacking the additional Centronics parallel interface. It also prints at a more modest 105 characters per second. This printer is unusual, though, because of its front-loading feature. You feed the paper through the front of the printer. The paper stays flat and is printed on by a vertical printhead. This unique design lets you print at the very top of a sheet of paper, and eliminates many paper-feed problems. Because the paper does not have to be wrapped around a platen, this printer can print on heavy

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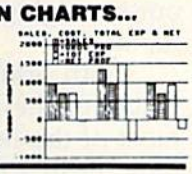

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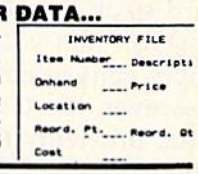

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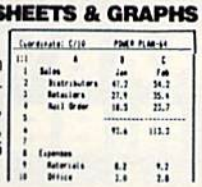

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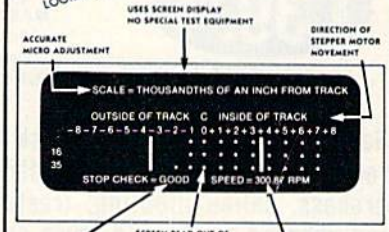
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Cardinal Software

card stock. It also has fold-down posts so that you can store the paper conveniently underneath. However, the C+ uses a somewhat unwieldy ribbon, with the ribbon exposed and stretched between two small modules. It's hard to install the ribbon without smudging a bit of it on your hands.

Both printers are a good value for the price, delivering most of the features shoppers look for in a dot-matrix printer. Although the print is not letter quality, it should be just fine for program listings, documentation, and letters to friends and relatives. Riteman's one-year warranty is good for peace of mind, especially since printers are more prone to breakdown than solid-state equipment.

—*Charles Brannon*

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SOFTWARE AUTHORS PLEASE WRITE

Monty Plays Scrabble

Few board games have proven as broadly popular and enduring as Selchow & Righter's Scrabble. Even in an era of fast-action arcade games with dazzling graphics, the classic crossword game continues to attract—and addict—hosts of players.

Now, in its thirty-seventh year of distribution, Scrabble is available for the 64. Called *Monty Plays Scrabble*, this program pits you against a computer opponent, Monty, and up to four other players. With a vocabulary of over 12,000 words, Monty is a worthy opponent to all but the more advanced Scrabble players.

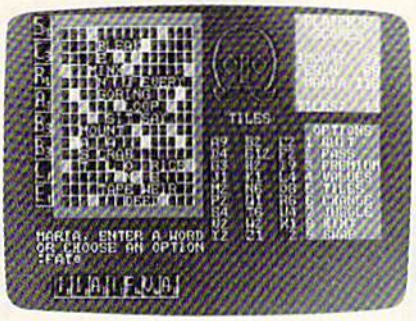
The traditional playing board is faithfully rendered on screen, with pink, light blue, dark blue, and red premium squares. Your tiles are displayed below; a menu of options appears on the right. In addition to the established playing choices in Scrabble—such as exchanging tiles or passing—the menu includes such options as Juggle (to rearrange the tiles on your rack); Hint (which suggests a playable word); and Swap

(which allows you to take over Monty's hand).

The program is easy to follow and comes with a complete set of instructions. You can choose to play against Monty, or you can watch Monty play against himself. And you can elect to watch Monty "think"—that is, you can see Monty's word choices and their scores as the computer searches for the most valuable word.

Like the board game, *Monty Plays Scrabble* can be a useful learning tool for younger players. The program is friendly and encouraging, offering messages of "Well Done!" or "Good Choice!" when a word is selected. And, in the process of watching Monty "think," the player becomes involved in working out every viable combination of letters along with Monty.

There are a few minor drawbacks, though. While the program checks Monty's words against a dictionary, it won't check the validity of the players' words. Since Monty won't "challenge" you, players will not be corrected if they use bogus or misspelled words. Also, it isn't possible to play only against another person—Monty deals himself in for every hand. And finally, because of the volume of possible letter combinations which must be checked at each turn, Monty may take several minutes to complete his turn, especially in the later stages of the game.



Monty Plays Scrabble is a welcome game for Scrabble aficionados who want a tireless partner, children who need a jostle-proof playing board, or teachers and parents who want a novel approach to vocabulary building.

—*Joan Rouleau*

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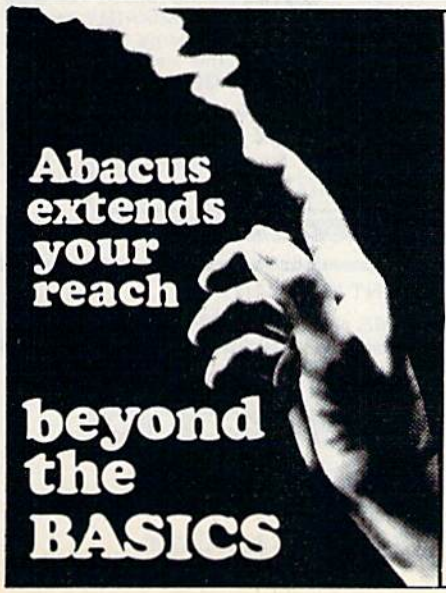

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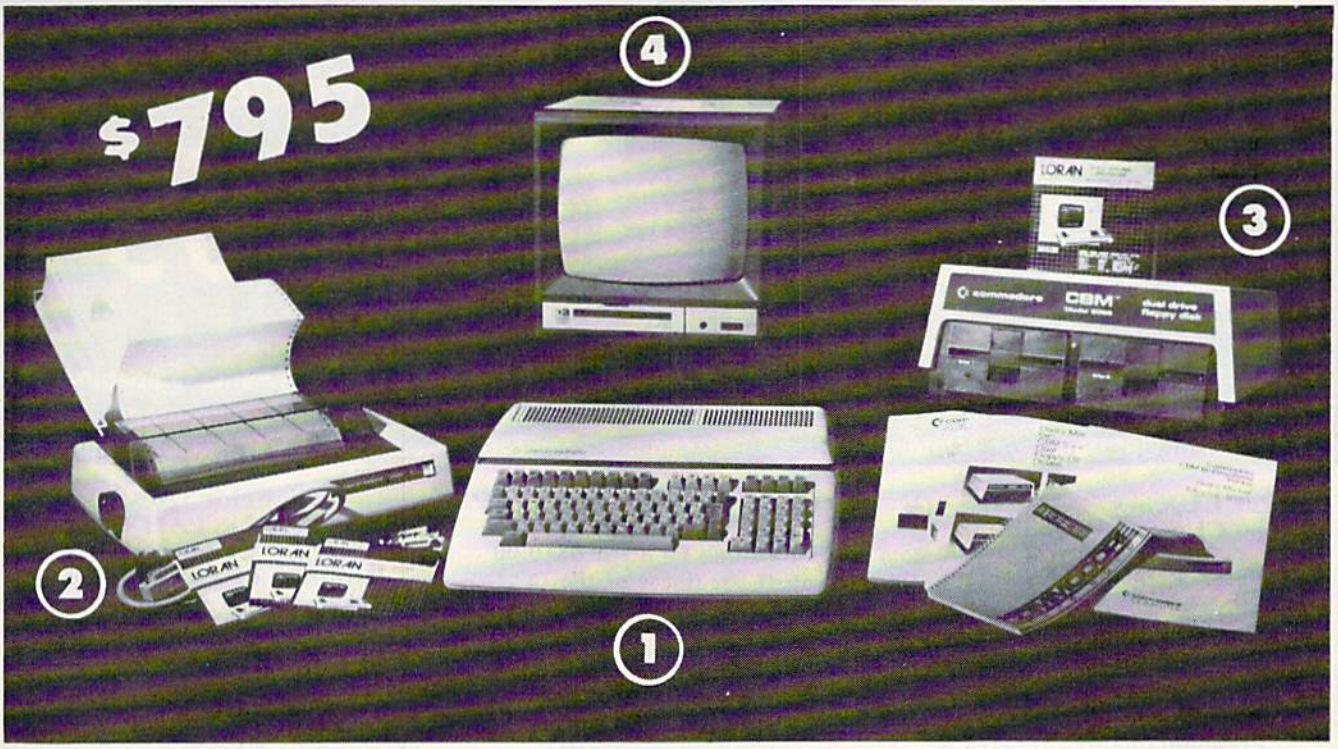

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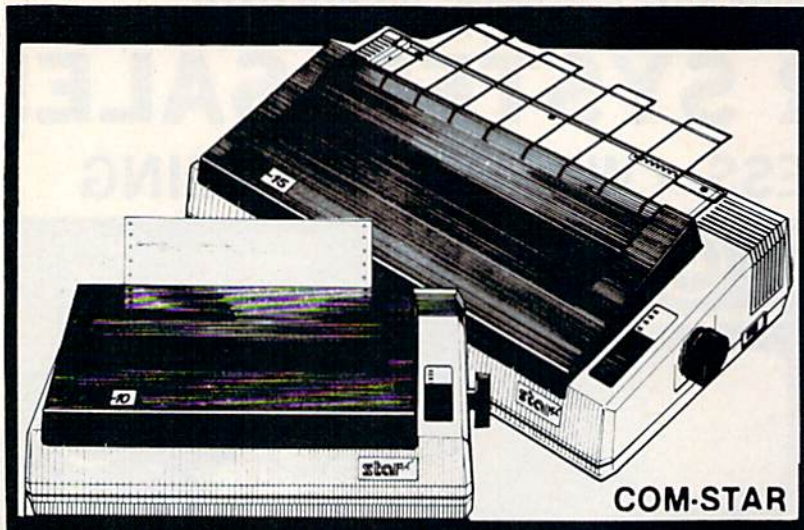

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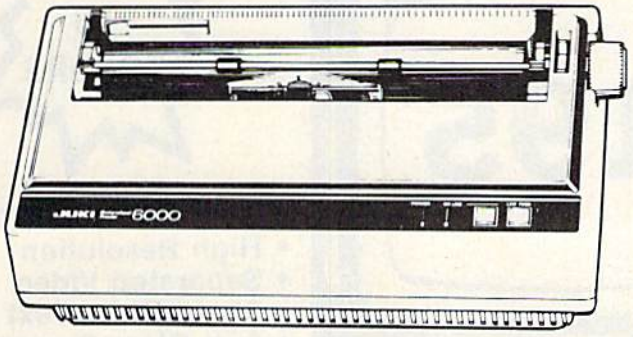

Letter Quality Printer

Letter Quality Printer/Typewriter

DELUXE LETTER QUALITY "DAISY WHEEL PRINTERS"

JUKI®
DELUXE COMPUTER PRINTER

List Price $399 **SALE $249**

- Superb "Daisy Wheel" Computer Printer
- 100 Characters
- Bi-directional with special print enhancements-many type styl $18.95
- Pitch 10, 12, 15 CPI
- Print Speed up to 12 CPS
- Print line width: 115, 138, 172 characters
- 12" Extra large carriage
- Drop in cassette ribbon (replacement $8.95)
- Centronics parallel RS 232 Serial interface built in (specify)

JUKI®
DELUXE "COMBINATION" PRINTER/TYPEWRITER

List Price $499 **SALE $299**

- Superb Computer Business Printer combined with the deluxe electronic typewriter!
- Two machines in one—just a flick of the switch!
- Superb letter quality correspondence—home, office, word processing!
- 12" Extra large carriage
- Drop in cassette ribbon—replacement $8.95
- Precision daisy wheel printing—many type styles! $18.95
- Pitch selector-10, 12, 15 CPS, Automatic relocate key!
- Automatic margin control and setting! Key in buffer!
- Centronics parallel or RS 232 Serial interface built-in (specify)

15 Day Free Trial - 90 Day Immediate Replacement Warranty

- COMMODORE 64 COMPUTER INTERFACE ONLY $49.00 - ATARI INTERFACE $79.00

ADD $10.00 for shipping and handling!!

Enclose Cashiers Check, Money Order or Personal Check. Allow 14 days for delivery, 2 to 7 days for phone orders, 1 day express mail! Canada orders must be in U.S. dollars. VISA — MASTER CARD ACCEPTED. We ship C.O.D.

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(Lowest price in USA)

13" Color Computer Monitor

16 COLORS

- Built in speaker and audio
- Front Panel Controls
- For Video Recorders
- For Small Business/ Computers
- Apple-Commodore Atari-Franklin-etc.

- Beautiful Color Contrast
- High Resolution
- Separated Video
- Sharp Clear Text
- Anti Glare Screen
- 40 Columns x 24 lines
- Supports 80 Columns
- List $399

SALE **$195**

15 Day Free Trial - 90 Day Immediate Replacement Warranty

12" XTRON SUPER HI-RESOLUTION "SWIVEL BASE" MONITOR

List $249 **SALE $119** *

80 Columns x 24 lines, Super Hi-Resolution 1000 lines
Green or Amber super-clear Easy to Read text with special anti-glare screen!

12" ZENITH HI-RESOLUTION GREEN OR AMBER TEXT DISPLAY MONITOR List $199 **SALE $99** *

80 Columns x 24 lines, Hi-Resolution-crisp clear easy to read text with anti-glare screen! A MUST for word processing.

12" MONITOR GREEN OR AMBER TEXT

80 Columns x 24 lines, easy to read up front controls

List $159 **SALE $79.95** *

***Plus $9.95 connecting cable!**

• LOWEST PRICES • 15 DAY FREE TRIAL • 90 DAY FREE REPLACEMENT WARRANTY
• BEST SERVICE IN U.S.A. • ONE DAY EXPRESS MAIL • OVER 500 PROGRAMS • FREE CATALOGS

Add $10.00 for shipping, handling and insurance. Illinois residents please add 6% tax. Add $20.00 for CANADA, PUERTO RICO, HAWAII orders. WE DO NOT EXPORT TO OTHER COUNTRIES.

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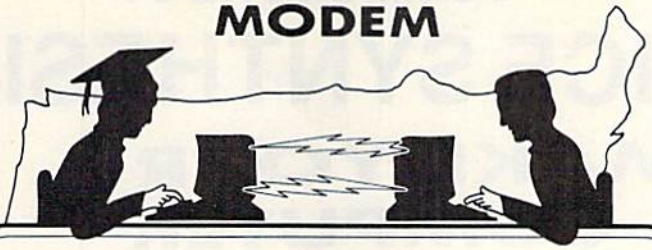
Commodore 64 MODEM

Sale



Sale

$59 List $129.95

Telecommunications

$59 List $129.95

FOR CHILDREN · ADULTS · BUSINESS

Complete Auto Dial Telecommunications Package

"The only telecommunications package you will ever need."

(Exclusive Easy To Use Features)

NEW

Total Telecommunications

NEW

• 300 Baud Modem • Auto Dial • Auto Answer • Upload & Download

• Membership in 52 Database Services (UPI News, etc.)

Reach Out and Access Someone

- Educational courses
- Financial Information
- Banking at Home
- Popular Games
- News Updates and Information
- Electronic Shopping
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The Total Telecommonications Package offers you all this plus ...

- Auto Log-on
- Dialing from Keyboard
- On-line Clock
- Capture and Display High Resolution Characters
- Download Text, Program or Data Files
- Stores on Disk Downloaded Files
- Reads Files from Disk and Uploads Text or Program Files
- Select Any Protocol (access almost any computer or modem)
- Plus Much, Much More

List $129.95

Special Low-Low Price $59.00

We are so sure this is the only telecommunications package you will need we will give you 15 days Free Trial.

Add $3.00 for shipping, handling and insurance. Illinois residents please add 6% tax. Add $6.00 for CANADA, PUERTO RICO, HAWAII, ALASKA, APO-FPO orders. Canadian orders must be in U.S. dollars. WE DO NOT EXPORT TO OTHER COUNTRIES.

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COMMODORE-64

VOICE SYNTHESIZER

NEW NEW

MAKE YOUR COMPUTER TALK

VOTRAX BASED HARDWARE

SALE ONLY $59.00

You can program any words or sentences • Adjust volume and pitch • Receive Modem messages • Make adventure games that talk • Real sound action games • Make customized talkies • (Demo disk or tape included)

You can add TEXT TO SPEECH SOFTWARE that allows you to simply type what you want to hear!! Also allows you to add sound and voice to SCOTT ADAMS and "ZORK" ADVENTURE GAMES. List $29.95. SALE $19.95. (Disk or Tape).

• LOWEST PRICES • 15 DAY FREE TRIAL • 90 DAY FREE REPLACEMENT WARRANTY
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COMMODORE 64

80 COLUMN BOARD

SALE

FOR ONLY $89.00

(Word Processor Disk Program included FREE!!)

Now you can program 80 columns on the screen at one time! Converts your Commodore 64 to 80 columns when you plug in the PROTECTO 80 Expansion Board. List $199.00. **Sale $89.00.**

Includes 4 Slot Expander and can be used with most existing software!!!

Add $3.00 for shipping, handling and insurance. Illinois residents please add 6% tax. Add $6.00 for CANADA, PUERTO RICO, HAWAII, ALASKA, APO-FPO orders. Canadian orders must be in U.S. dollars. WE DO NOT EXPORT TO OTHER COUNTRIES.

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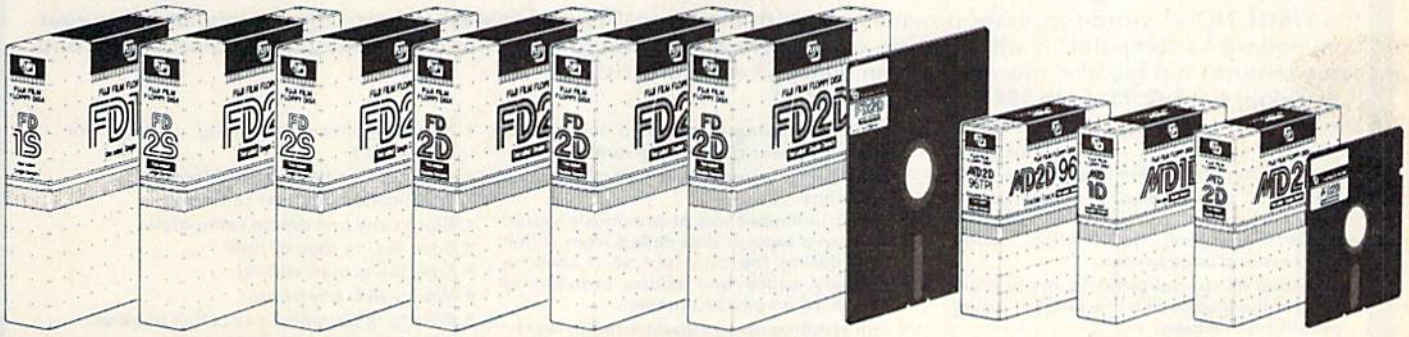
FUJI SALE $1.49 ea.

Premium Quality Floppy Disks



Box of 10 *with hub rings, sleeves and labels*

Famous Brand FUJI Floppy Disks for those who care about keeping their data.

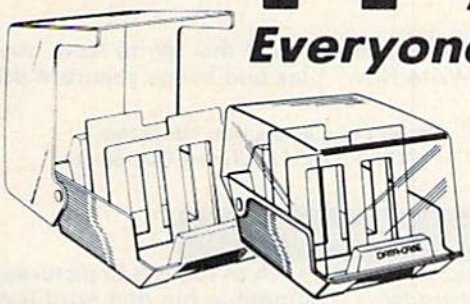
Single Sided — Double Density
for Commodore 64, Atari, Apple

List $39.95
Sale $14.90

*** $12.95** ☆☆ ***Flip-N-File*** ☆☆ *** $12.95**

Data-Case

Floppy Disk Filer



Everyone Needs a Floppy Disk Secretary

Facts:

- Dust and Dirt particles can hurt your disks
- Most disks go bad due to mishandling in storage
- Proper filing of your disk collection will reduce unnecessary handling of your disks

The Floppy Disk Filer is an inexpensive hard plastic Fliptop case that will allow for easy filing, and protect your disks from dust, smoke, and dirt. Plus, the Floppy Disk Filer will keep all your disks out of unwanted hands and in one place where you can easily find them. **(Holds Over 50 Disks)**

List $24.95 **Introductory Sale Price $14.95** ***Coupon $12.95**

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Commodore 64 **CARDCO** Commodore 64

Fulfill All Your Personal & Business Needs "NOW"

Write Now! — Word Processor

Easy To Use Cartridge Based Word Processor for the C-64, With Full 80 Column On-Screen View Mode

The WRITE NOW! word processor provides you with the easiest to use, fastest to learn format available for your Commodore 64 computer. It will give you all the fetures you would expect in a professional word processor and some features not found in any other Commodore 64 word processor.
(Cartridge) List $49.95. **Sale $34.95.** *Coupon $29.95.*

- Program is on cartridge and loads instantly so there is no waste of time loading from unreliable tapes or disks.
- Built in 80 column display allows you to see exactly what you will print including headers, footers, justification, page numbers and page breaks.
- Can send all special codes to any printer, even in the middle of a line without losing proper justification.
- Page numbering in standard numbers or upper or lower case Roman numerals.
- Full string search and search/replace functions.
- Direct unlimited use of previously stored text from tape or disk called from within text during the print out so it uses no memory space and allows creation of unlimited length documents.
- Full scrolling up and down through text.
- No complicated editing modes or commands.
- Multiple line headers and footers.
- Justification and text centering.
- Block copy and delete commands.
- Save text to tape or disk.
- Easy full screen editing.
- Works with any printer.
- Easy to understand instruction booklet.
- 4 help screens included.

Spell Now — Spell Checker

"Spell Now" is a disk based professional spelling checker that interfaces with the "Write Now" word processor for the C-64. Use "Spell Now" to check the spelling in your "Write Now" files. It includes all features of the most expensive spelling checkers on the market. (Disk) List $39.95. **Sale $19.95.**

- 34,000 word dictionary.
- 1,000 word mini-dictionary.
- Unlimited number of supplemental dictionaries (user-definable).
- You see status of spelling check.
- Menu-driven; user-friendly.
- Fully compatible with "Write Now"
- Allows for marking, immediate correction and viewing in context.
- CARDCO, INC.'s Lifetime Guarantee.

Mail Now — Mailing List Software

The "Mail Now" is a disk based full random access data base designed to be used with the "Write Now" word processor. "Mail Now" allows the user to merge an address file into the text of the word processor for form letters. (Disk) List $39.95. **Sale $19.95.**

- Machine language fast sort.
- User-friendly, totally menu-driven operation.
- 10 character comment line.
- User-defined, print format can print one, two or three labels across.
- 2 character category field.
- Supports 600 entries per disk.
- Quick (in memory) sorts by Zip, Category, Last name and State.
- Includes data back-up utility.
- CARDCO, INC.'s Lifetime Guarantee.

File Now — Database

"File Now" is the inexpensive data base you've been waiting for. "File Now" interfaces with the "Write Now" word processor for the C-64. Helps you with data base management of your "Write Now" files and keeps separate data bases for other important information. (Disk) List $39.95. **Sale $29.95.**

- Functions as a deck of 3 x 5 note cards.
- Fields are user-definable.
- Full edit features; add, edit, delete.
- Searching is bidirectional.
- Wild card searching and printing.
- Capacity up to 700 cards per file-disk.
- Fully compatible with "Write Now".
- CARDCO, INC.'s Lifetime Guarantee.

Graph Now / Paint Now — Graphic/Logo Generator

A full graphics package capable of generating line, bar graphs and graphic art designs such as logos and pictures to be used with "Write Now" for the C-64. Save your graph or logo in a "Write Now" compatible file and print it out along with your "Write Now" text file. (Disk) List $39.95. **Sale $19.95.**

- Allows plotting of x,y coordinates from software or keyboard.
- Compatible with "Write Now" files.
- Menu-driven; user-friendly.
- Draw lines, rectangles and circles.
- 3 fill shades; white, gray and black
- Character font editor
- Load or save graphics.
- Optional joystick control.
- CARDCO INC.'s Lifetime Guarantee.

Add $3.00 for shipping, handling and insurance. Illinois residents please add 6% tax. Add $6.00 for CANADA, PUERTO RICO, HAWAII, ALASKA, APO-FPO orders. Canadian orders must be in U.S. dollars. WE DO NOT EXPORT TO OTHER COUNTRIES.

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The Most

Commodore 64

Practical Business Software

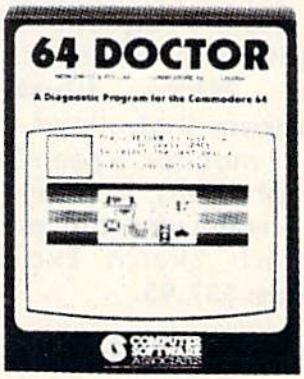
Special Low Low Prices - While Supplies Last

• Word Processor • Spread Sheet • Data Base • Diagnostic

• Track Expenses, inventories, investments • Make Charts and Graphs • Project Profits

• Keep Mailing Lists • Change Records, numbers, methods of filing • Information Retrieval

• Test RAM Memory • RS-232 Port • Keyboard • Video • Audio • Joystick • Printer • Disk Drive • And More!



Practicalc 64: A consistent best seller, Practicalc 64 has become a reference standard among Commodore 64 spreadsheets. With features like alphabetic and numeric sorting and searching, variable comumn widths, graphing and over 30 math functions, this program is an exceptional value. Practicalc 64 also interacts with Practifile, forming the perfect small business bundle.
List $59.95. **Sale $24.95**. (Disk or Tape)

Practifile: Flexibility and large capacity make Practifile the ideal data-base manager for the Commodore 64. (3800 records per file, sorts 5 fields at once.) Files written with the program are compatible with Practicalc 64 and popular word processing programs such as EasyScript, Word Pro, PageMate and PaperClip. Finally, a full-featured data-base at an affordable price!
List $59.95. **Sale $24.95**. (Disk.)

64 Doctor: A special diagnostic program for the Commodore 64, 64 Doctor takes the guesswork out of isolating troublesome hardware problems. The program tests each piece of hardware to pinpoint defects and help prevent costly and time-consuming service calls. An essential program for all Commodore 64 users!
List $34.95. **Sale $19.95**. (Disk.)

PractiCalc II *Better than Lotus 1-2-3* *Coupon $44.95*

PractiCalc II, a fast, versatile spreadsheet with database and word processing features, does away with erasers, broken pencils and a wastebasket filled with scrap paper. PractiCalc II, with its functions and features, has the ability to complete simple and complex tasks. PractiCalc II is flexible enough to be used for checkbooks, alphabetized lists, home budgets and business financial statements. PractiCalc II is the tool of the eighties. List $69.95. **Sale $49.95.** Coupon $44.95. (Disk)

With PractiCalc II you can:

- Use 250 rows by 100 columns
- Use 36 math functions from simple addition to square roots and trig functions.
- Sort alphabetically and numerically.
- Use upper and lower case letters.
- "Hide" columns of numbers for special reports without losing data.
- Create fixed titles of several rows and/or columns.
- Replicate any data in any area.
- Adjust individual column widths.
- Use graphic display option.
- Set global and individual cell formatting.
- Use IF ... THEN statements.
- Edit labels and formulas.
- Format disks from within the program.
- View disk catalog from within the program.
- Write expanded labels up to 88 characters long.
- Insert, delete and move information with ease.
- Start using PractiCalc II within ten minutes of opening the package.
- Consolidate separate spreadsheets for totalling.
- Search for known and variable entries.

Add $3.00 for shipping, handling and insurance. Illinois residents please add 6% tax. Add $6.00 for CANADA, PUERTO RICO, HAWAII, ALASKA, APO-FPO orders. Canadian orders must be in U.S. dollars. WE DO NOT EXPORT TO OTHER COUNTRIES.

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Computer Learning Pad

- **Makes graphic tablets Obsolete**
- **Includes Special Printer Feature**

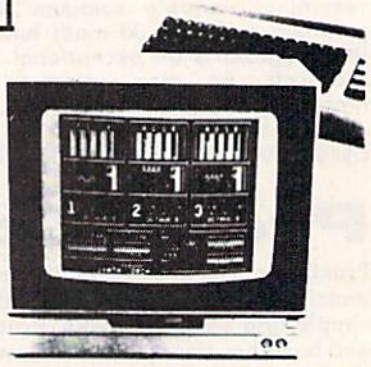
Sale! $37.95 **Hi-Resolution!**

Now you get this **Fantastic Tech Sketch Computer Light Pen Program** with a **Professional Light Pen Free!** ($39.95 value) plus the **Micro Illustrated Graphics Pen Program** that allows you to draw on your T.V. or monitor screen (better than Gibsons $99 light pen). Whatever you can draw on the screen you can print on your printer (A Tech Sketch Exclusive.) (Disk) List $59.95 **Sale $37.95.**

Also available is **Lite Sprite**, a light pen driven sprite builder (List $39.95 **Sale $29.95**).

MUSIC PORT

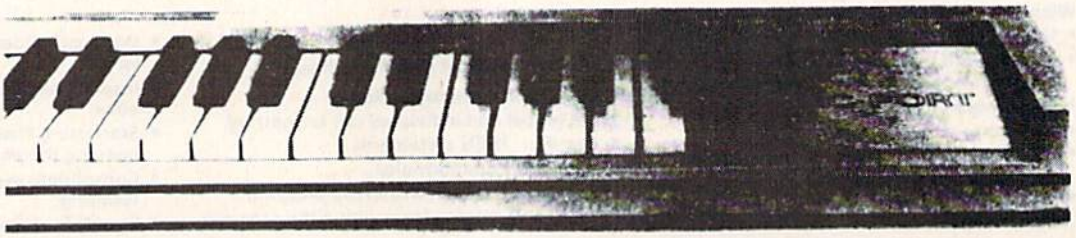
The ultimate music synthesizer and multi-track recording system for the Commodore 64. A **Full-sized REAL Keyboard** and all software including printing to the printer and preprogrammed songs are included. (Disk) List $149.95 **Sale $99.00.**



Fully Responsive "MUSICIANS" Keyboard

Sale! $99.00

No Extra Software Required



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American Educational Computer

NEW NEW

• Learn at home • Easy To Use • Colorful Graphics • Motivating and Fun • Teacher Designed

All programs were written by teachers and have been classroom validated. These programs teach in a standard classroom format with rewards as the user gets through the various lessons.

(Disk)

US Geography Facts — Has 35 pre-programmed lessons plus an authoring system that lets you create your own lessons. Excellent for teaching and reinforcing factual knowledge of the U.S. After completing two lessons the user earns the right to play a unique and challenging maze game. Fantastic educational value.
List $29.95. **Sale $16.95.**

US Government Facts — 35 lessons plus authoring system included. This program was designed for the following: • Eighth grade American History • Ninth grade Civics • High School electives in government • College refresher courses in government and American History. Fantastic aid to learning about American government.
List $29.95. **Sale $16.95.**

(Disk)

Commodore 64

(Disk)

AEC Spelling — A series of seven educational software programs for grades 2 through 8. It teaches the spelling of 4,000 words most commonly used in writing (98% of most people's writing vocabulary). The word lists used are the result of over 25 years of research into the writing/spelling needs of children and adults. Each grade level consists of one two-sided disk with word lists on one side and study activities on the other. The activities are designed to develop mastery in spelling utilizing a Test/Teach/Test approach. A pre-test is used to find out which words a user cannot spell correctly. These are recorded on a "Words To Study" list. The activities for learning these words are provided. Finally, a post-test is taken by the learner to measure progress. The approach is simple and rewards are built in. List $99.95. **Special Sale — 7 programs $34.95**. *Individual programs $19.95. (Specify grades 2-8).*

(Disk)

Commodore 64

(Disk)

Reading Comprehension Skills — Reading Comprehension Skills, 1, 2, and 3 help the learner develop the ability to read with understanding. The learner does work with cause and effect, similarities and differences, predicting outcomes, finding main ideas, differentiating between fact and opinion, etc.

	List	Sale
Level 1 (grades 1-3)	$29.95	**$16.95**
Level 2 (grades 4-6)	$29.95	**$16.95**
Level 3 (grades 7-8)	$29.95	**$16.95**

Words In Reading (Vocabulary) — Learn About Words In Reading, 1 and 2 teaches the structure of words to ensure success in reading. Such topics as prefixes, suffixes, contractions, synonyms, etc., are among the structural skills included in the program to promote progress and good grades in reading.

	List	Sale
Level 1 (grades 1-3)	$29.95	**$16.95**
Level 2 (grades 2-4)	$29.95	**$16.95**

(Disk)

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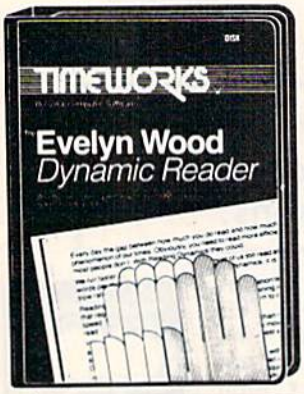
Com-64 TIMEWORKS® Com-64

Evelyn Wood Speed Reading



The EVELYN WOOD DYNAMIC READER provides you with the exercises and tools you need to help you increase your reading comprehension and speed. You can use your own personal computer and develop your skills at your own pace. You can learn the essential techniques of Dynamic Reading in your own home — at any time that is convenient for you. You can repeat exercises as often as you wish to assure that you maintain optimal reading efficiency.

SALE $44.95

Evelyn Wood *Dynamic Reader*

List $69.95

An effective and enjoyable way to improve your reading comprehension, retention and speed.

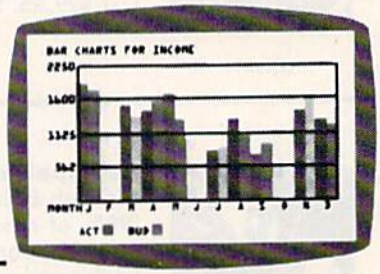
(See Page 29, 30, 54)

Home Management Sale

Data Manager 1

A general information storage and retrieval system — with exclusive "X-SEARCH" Feature.

List $24.95. **Sale $16.95.**



The Electronic Checkbook

Check recording, sorting and balancing system.

List $24.95. **Sale $16.95.**

The Money Manager

Home and business budget and cash flow system.

List $24.95. **Sale $16.95.**

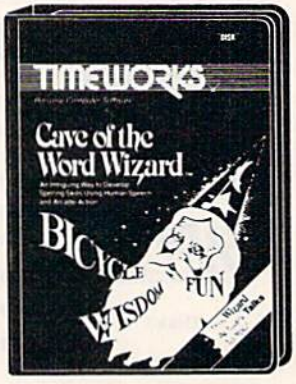
All three Programs for only $44.95

Cave of the Word Wizard

For Commodore 64 Computers

An Intriguing Way to Develop Spelling Skills Using Human Speech and Arcade Action.

This state-of-the-art educational program includes 500 spoken words in 10 spelling skill levels and makes full use of the sound capabilities of your computer. The Wizard will talk to you in clear human speech. No additional hardware is needed for your computer system. (Tape/Disk)



List $39.95. **Sale $22.95.**

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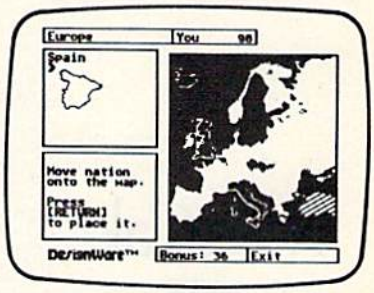
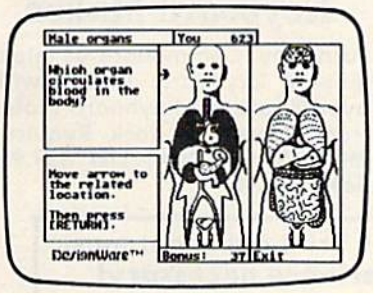


Commodore 64



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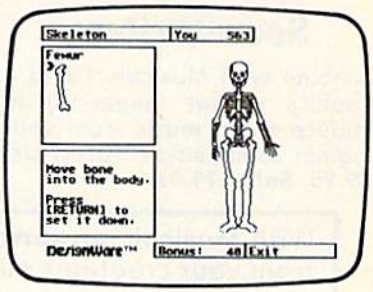
Commodore 64



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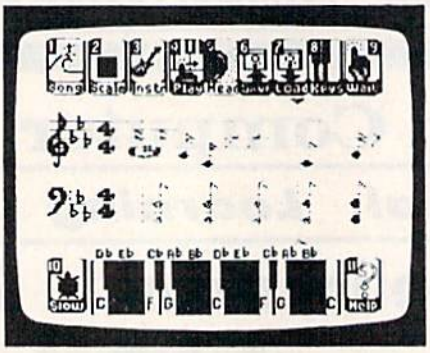

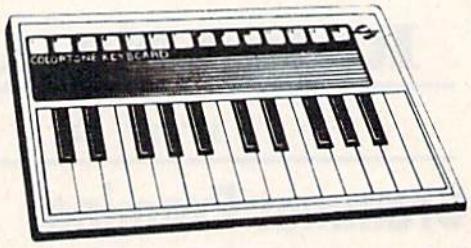

ColorTone Keyboard — Now you can play and learn just like on an organ. Just point to one of the colortone's preset songs, change the musical scale you are playing in or make your Commodore 64 sound like one of eight different instruments. As you play, you'll see the notes you're hearing displayed on a musical staff then record your musical creations to listen to them again and again. List $59.95. **Sale $29.95.**

Turn Your Commodore-64 Into A Sophisticated Musical Instrument

"The Program That Gives You A Reason To Buy A Commodore-64."
New York Times.

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MusiCalc 2 ScoreWriter

MusiCalc 1 Synthesizer & Sequencer

MusiCalc 3 Keyboard Maker

ScoreWriter

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Synthesizer & Sequencer

This 1st step turn your Commodore-64 into a sophisticated musical instrument — a three voice synthesizer and fully interactive step sequencer play along with pre-recorded songs or develop your own and record the music you create. (Disk)

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Keyboard Maker

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Commodore 64 **EPYX** Commodore 64

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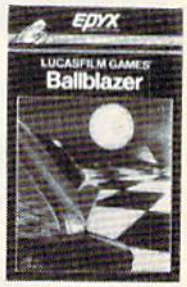
World's Greatest Baseball — Finally a great sports game. Realistic right down to the playing field. Control all the actions even the outfielders. Play realistic baseball all year round. (Fantastic graphics, action, and sound!) (Disk) List $34.95. **Sale $22.95.**



Ballblazer — Unique split-screen, 3-D graphics give you and your opponent a first person view of the field of play. You race across the playfield in your Rotofoil trying to capture the ball and fire it through the goal before your opponent. The winner is the player with the most points at the end of the timed competition. Hold onto your joystick and keep that finger on the fire button, this is the type of two player head-to-head action you've been waiting for. Two Players. (Disk) List $29.95. **Sale $21.95.**

Fast Load Cartridge — Load, save and copy disks five times faster than normal. It plugs into the cartridge port of the Commodore 64 and goes to work automatically, loading disks with ease. And that's only the beginning. It can copy a single file, copy the whole disk, send disk commands, and even list directories without erasing programs stored in memory. (Cartridge) List $39.95. **Sale $24.95.**

Barbie — The biggest name in dolls. Browse through Barbie's closet full of beautiful clothing and dress her for the party. You can cut her hair or make it longer and color it or change the style. Buy new clothing at the boutique or any of the six other specialty shops, or even go to the dress shop and create Barbie's designer clothes with the help of the computer. The combinations are endless and so is the fun. One or two players. (Disk) List $39.95. **Sale $24.95.**

G.I. Joe — The best selling toy soldier is now available as an activity toy on the home computer. Select the battle situation then choose the equipment you think you will need to get the job done. Choose from a number of uniforms and weapons in your well stocked arsenal and get ready for the action. Play alone or with a friend, if you plan the right strategy you will complete the mission if not you will have to try again. One or two players. (Disk) List $39.95. **Sale $24.95.**

Hot Wheels — Now all the action and fun from playing with Hot Wheels cars is taken one step further on the home computer. Hot Wheels lets you choose your play activity from repairing cars to the destruction derby. You can actually play the activities along with a partner on the computer screen, even build and customize your own cars. A whole new way to play Hot Wheels. One or two players. (Disk) List $39.95. **Sale $24.95.**

Break Dance — Break Dance is an action game in which your dancer tries to break through a gang of break dancers descending on him. "A simon-like game" where your dancer has to keep the steps of the computer controlled dancer, and even a free dance segment where you develop your own dance routines and the computer plays them back for you to watch. Now anyone can break dance!! (Disk) List $39.95 **Sale $24.95.**

Rescue On Fractalus! — Your mission is to fly your Valkyrie Fighter through the Jaggi defenses and rescue the downed Ethercorps pilots. Sounds easy, but don't let it fool you. It's tough enough jut to navigate the mountains and canyons of Fractalus, but try doing it while destroying enemy gun emplacements or dodging suicide saucers. We supply the Long Range Scanner, Dirac Mirror Shield and Anti-Matter Bubble Torpedoes... YOU supply the skill and guts! One Player. (Disk) List $29.95. **Sale $21.95.**

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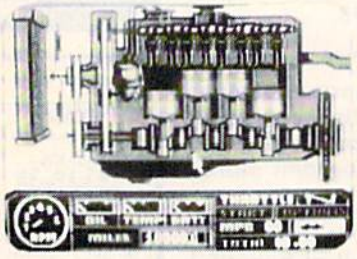
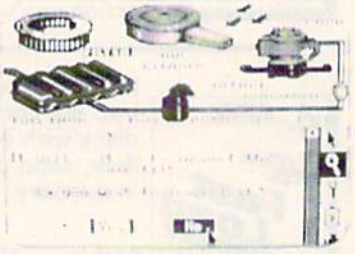
The Time Machine

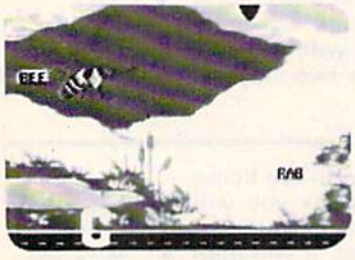
Based on H.G. Wells' science fiction classic, THE TIME MACHINE adds unique joystick action, high-resolution graphics and extensive animation to Wells' ageless prose. Travel through the treacherous time tunnel. Venture into the mysterious land of the future. Befriend the gentle Eloi and struggle to save them from evil Morlocks who lurk in the dangerous underworld. Regain your time machine at all costs — or your tale will end in tragedy! (Disk) List $39.95. **Sale $29.95.**



Injured Engine

Work with an accurate cutaway representation of a functioning automobile engine. Brilliant graphics detail various engine systems and parts. Learn the names of each part and how it relates to the other parts of the engine, then, use your knowledge to diagnose computer-generated engine problems. Inspect and test at will but remember everything costs! Work against the clock to tune and repair the motor to perfect running condition. (Disk) List $39.95. **Sale $27.95.**





Speak and Seek

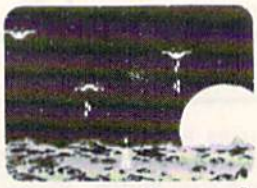
It talks!! Speak and Seek teaches the alphabet to children, ages 2-5. It shows children how to print letters in capital and lower cases, pronounces the letter as it is drawn and asks them to find and press the letter on the keyboard. Incorrect answers prompt a variety of helping phrases, such as "Try a little to the right" or "Try higher," and other encouraging and amusing feedback. The make a creature appear that starts with the collect letter. (Disk) List $39.95. **Sale $27.95.**

Commodore 64

Macbeth

Shakespeare's enthralling play of murder, greed and intrigue comes to life in this startlingly textured and vivid treatment. Armed with your wits, an impeccably detailed edition of the Scottish play and a learned mentor who questions and guides your insights and judgements, the play's the thing for you to solve! An engrossing and educational interactive adventure!. (Disk) List $39.95. **Sale $29.95.**

Commodore 64



Demon Attack

Winged warriors wreak havoc from above! Only your laser cannon stands between you and oblivion! Blast those bizarre demons. Your arsenal includes missiiles and sheer intestinal fortitude. Only the strong survive! (Disk) List $24.95. **Sale $16.95.**

Nova Blast

Pilot your own Novon Skysweeper above the underwater city. You must defend four cities in your quadrant from alien assault. Use your radar to detect enemy activity. Race to protect these civilized outposts in a deadly game of skill and strrategy. (Disk) List $24.95. **Sale $16.95.**

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Encounter — An amazingly lifelike simulation of a futuristic tank battlefield, Encounter has only four elements — a grid made of indestructible pylons, enemy saucers, homing drones, and you. Yet these simple components create a challenge requiring total concentration and great skill. Your task — clear the grid of enemies. Success requires a thoughtful balance between sensible caution and raw courage. Keep your cool, accomplish your mission, and you enter another level — eight in all — where enemies become infinitely more clever, and so must you. Encounter is a purist's game, stripped to the essentials. This no-frills approach demands everything you've got. (Disk) List $34.95. **Sale $16.95.**

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Rainbow Walker — Outsmart the devil and a very vicious bird, survive tornadoes and avoid the lightning bolts as the elf hops onto gray squares to create a brilliant rainbow and reach the pot of gold. You'll need razor-sharp reflexes, delicate precision with your joystick and a knack for strategy. Once you start playing, you'll find it impossible to stop. *(Includes Doughboy)*

Doughboy — Don't expect DOUGHBOY to be any easier. You'll spend hours trying to outsmart the cleverest opponents while you attempt to recover the supplies that are scattered across the play field. Rocks, trees, trenches and mortars, combined with the dark of night, will surely challenge your wits and skill. Don't let your batteries in your flashlight go dead! (Disk) List $29.95. **Sale $19.95.**

New York City — You can now visit the Big Apple without leaving home, and you'll soon discover that all the stories you've heard are true! No sooner do you park your car for a visit to some of the most popular landmarks than it's stolen, and that's only the beginning. The subway is sure to make it hard to visit the Empire State Building, Central Park and Grant's Tomb. Metropolitan madness will drive you crazy — especially if you run out of gas or cash, or get hit in the crosswalk! *(Includes Air Support)*

Air Support — Air Support is two games within a game providing the player a choice of an arcade game or one of strategy. Control the chopper and robots with a wide variety of commands to choose from. Select the difficulty range, terrain, number of enemy robots, airlift and bombs and begin to accomplish your mission of destroying the enemy robots. (Disk) List $29.95. **Sale $19.95.**

Quasimodo — Quasimodo is a loner who like hanging out in castle belfries. He also knows the secret hiding place where the royal jewels have been hidden. But, he is too busy stoning the soldiers and swinging from bell to bell to get away from the bats. Only you can help Quasi get the jewels. *(Includes Warriors of Zypar)*

Warriors of Zypar — Exciting 3D action makes Warriors of Zypar one of the most exciting two player games released this season. Placed in an arena setting, you will challenge your opponent by trying to knock him off his aero disk. Score extra points by shooting the flying ball into the mouth of the evil ZYPAR. A game that combines the barbaric adventure of the old Roman gladiators with the fast pace concept of soccer and handball all in one. Challenge your partner or your computer and play for hours. (Disk) List $29.95. **Sale $19.95.**

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Real World Software

Part 1: A Bright New Trend In Home Computing

Fred D'Ignazio, Associate Editor

VisiCalc For The Home?

I recently returned from Las Vegas, where I covered the Winter Consumer Electronics Show (CES) for *The New Tech Times*, a national public TV program on consumer electronics. Based on what I saw, this is my verdict:

The home-computer industry is at its lowest point in years. Home computers are no longer the "in" thing to buy. They have been replaced by VCRs, compact discs, pocket TVs, and other glamorous newcomers to the consumer electronics industry. As a result, hardware and software companies have gone out of business, computer magazines have shrunk for lack of advertisers, and Wall Street investors and the national news media have lost interest and are looking elsewhere for what is new and hot.

Some observers have equated home computers with videogames and hoola hoops, and have predicted the demise of the home-computer industry. But I think this assessment is too gloomy. I don't believe we're at the end of the home computer revolution, we're only in a trough.

What will get us out of that trough?

A new generation of even lower-priced, even more powerful computers, like Atari's new ST series and Commodore's Amiga, will give the industry a tremendous boost. But fancy new computers are not the only way to revive this industry. We also need new kinds of software—programs that are so exciting, low-cost, and practical that they will motivate people to buy a new computer just so they can run the software.

What kind of software should we look for? Some observers are on the lookout for a "*VisiCalc* of the home"—a product so unique and powerful that, single-handedly, it will answer the consumer's still nagging question, "Why do I need a home computer?"

I think it's unlikely that a single program will emerge and provide a compelling justification for buying a home computer. Home computer users are too diverse a group, and homes are too complex and heterogeneous for a single product to answer everyone's needs. Instead, I think that we should look for a whole new genre of home software that thrusts the computer into the real world. I see such a genre now on the horizon, a genre I call *real world software.*

What Does It Feel Like?

This month and next I'll describe, define, and give examples of what I mean by real world software. But these are just words. The ultimate test

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Fred D'Ignazio is an associate editor of COMPUTE! *and* COMPUTE!'s GAZETTE. *He is a regular commentator on* The New Tech Times, *a national public TV program on consumer electronics, and he is a frequent guest on public TV's* Educational Computing. *Fred's latest book is* Computing Together: A Parents and Teachers Guide to Using Computers with Young Children *(COMPUTE! Publications, 1984, $12.95). Fred is an avid computer networker and welcomes electronic letters from his readers. Write to Fred on The Source (BCA638), CompuServe (75166,267), MCI Mail (Fred D'Ignazio), EasyLink (63856637) or c/o COMPUTE! Publications.*

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OUTS. I'LL CHECK IN LATER.

is to try the software out and see how the software feels to *you*. You'll recognize real world software when you come in contact with it. And it will mean something different to each person who experiences it.

As I prepared this column, I spoke to many different people in the software industry. When I told them I was writing an article about "real world software," the amazing thing was that they immediately knew what I meant, even before I tried to define it or describe it. And they began telling me what real world software meant to them and what examples they had seen recently.

One person I spoke to had this reaction: "Real world software. *Kitchen sinkware.* Stuff that you keep around the house like a bottle of glue, a flashlight, or a screwdriver. You never know when you'll need it. But you will."

When I told my assistant, Kim Harris, about real world software, she thought of her boyfriend, Robert Ruff. "Robert is working on a construction crew," she told me, "building a new shopping mall. He's so happy because he's learning valuable things about architecture, electronics, and engineering. He'd rather learn this way than study books in a classroom. Maybe that's what real world software is. It's *on-the-job training*, the kind that Robert likes."

When I mentioned real world software to Jeff Clarke, executive producer of *The New Tech Times*, he too instantly recognized it. "It's like the high-tech stress cards we're giving out at CES," he said. "The cards tell you whether you're relaxed or tense, and, if you are tense, they give you simple techniques you can use to relax. The cards are like your "real-world" software should be. They are simple to use, and they give immediate, personally meaningful information and results."

What Should It Do?

Based on the comments above, defining real world software is easy. It's easy-to-use software that gives an immediate, direct, visible benefit to a person in his or her daily life.

As I see it, real world software is really *self-improvement* software. It gives you the skills you need to tackle all areas in your life more creatively and effectively.

When I talked to John Paulson, president of Springboard Software, he warmed immediately to the idea of real world software. "That's just what we need," he said. "With real world software the computer will beckon, teach, work for you as a tool, then send you out armed and eager into the real world to apply the skills you have learned."

How Does It Work?

The goal of real world software is to be a *self-teaching tool.* To do this effectively, it needs to weave together several key elements, including a knowledge database, skill in applying that knowledge base to real life, and a playful approach that makes it fun to learn the knowledge and apply the skill.

Real world software must be a powerful tool. But it must also teach us how to use the tool, give us practice in applying the tool, and thrust us into real-life situations in which we get to use the tool and improve our technique. Last, it must suggest applications in the real world where we can apply the tool after we have left the computer.

What features should real world software have? First, it should be simple to learn and simple to use. It must be immediately accessible to a child or a beginner of any age.

Beyond that, it must be playful, charming, and appealing to young and old alike. As John Paulson put it, the software must *beckon.* It makes learning a new skill a thrill, not a chore.

The program should also let a person get right to the action. The mechanics of the program should be so easy to master that a person can go immediately beyond the program to the knowledge areas, skills, and applications the program teaches.

On the other hand, the program should not be a black box, blocking the naïve user from its power; or a child's toy that has no relevance outside a toy world.

Rather, it should be at once simple yet powerful. The rules for using it should be intuitively obvious. As the person uses it, he or she should become more adept at using it further. The program should let a person *learn on the job.*

Third, there should be a strong factual basis to the knowledge that the program imparts. Real world software is really *expert software* that everyone can use.

Fourth, the program should use the latest ideas in program design, including icons (pictures representing information or courses of action); contextual help screens; on-screen menus or pull-down menus; and a choice of mouse, joyboard, or keyboard control (or a user-determined mix of all three).

This is a controversial area with lots of conflicting opinions. As Marc Canter, president of MacroMind (developer of the Macintosh *MusicWorks* and *VideoWorks* programs from Hayden Software) says, "The world is divided into two camps: people who type in commands and people who don't; people who memorize commands and people who don't." Canter is one of those people who doesn't like to memorize or

type in commands and says, "I never want to go back." Then there is Richard Mansfield, senior editor of COMPUTE! Publications, who wrote in the February 1985 issue of COMPUTE!, "It's far easier, for many people, to simply type LOAD 'PROGRAM' than it is to move a mouse to a menu, pull down the disk menu, move to the program name, move the mouse up to the word LOAD, etc."

Canter is in one camp, Mansfield in the other. This is why people should have a *choice* in the way they interact with a real world program. And they should be able to customize their own means of interaction.

Next, a real world program should contain several discrete modes, including introductions to the tool, knowledge area, and skill in using the tool; an online tutorial; challenging real-life scenarios for practice; and the actual tool itself once the user is ready to get down to business.

The actual tool should have shades and gradations beginning with novice and ending with expert. The software should enable each person to use the tool unconsciously at his or her level of confidence and expertise.

The software should be powerful enough to be attractive to experts; but, more importantly, it should offer the beginner a step-by-step approach to learning a new skill, with numerous opportunities to practice the skill and get immediate, constructive feedback.

Sixth, real world software should come with a substantial users manual. The manual shouldn't waste time explaining the software; the software itself will take care of this. Instead, it should be a practical yet literate introduction to the knowledge embodied in the software, and a checklist of the powerful ideas and techniques embedded in the tool. It should also be an idea book full of suggestions and activities a person can do with the software.

Seventh, the software should be supplemented with additional, lower-cost software packages with databases, templates, and other supplies that help personalize the software for different users and introduce users to different subjects. It should also, of course, let users enter their own databases.

Eighth, the software should have easy-to-use recordkeeping features that enable a child, parent, or teacher to monitor a learner's progress as part of the software's *hidden curriculum* in a particular discipline or domain of knowledge.

Ninth, the program should place great emphasis on on-the-job, practical training in the context of an adventure, a mission, or a story. A person should be given real-life situations, goals, and challenges. Mastery of the skill should permit them to meet these goals and overcome these challenges. Then the software should rush them out the door and urge them to apply the skill immediately in the real world.

On-the-job training, real-life situations, and immediate transfer to the person's daily life are the key features. The program should combine the cerebral, bookish world of the ivory tower with the do-or-die immediacy of the space shuttle cockpit, the scientist's lab, the executive's hotseat, or the ditchdigger's muddy hole. The force of intellect in all human advances is derived from a blend of the practical and the abstract. Real world software can merge these two components of knowledge into powerful and beneficial learning programs for home computer users.

Examples Of Real World Software

Have I whetted your appetite for some examples of real world software? If I have, good! Next month I'll give you *106* examples of real world software in 24 different areas of knowledge, including skills in medicine, college studies, communication, crafts, dance, diet and nutrition, exercise, map reading, inventing, math, money management, music, organization, outer space, relating to other people, running a newspaper, predicting the weather, and designing bridges and buildings.

After I give these examples, I'll tell you my wish list for real world software on Commodore computers in the future. And I'll ask you, the reader, what real world software you've seen and what you'd like to see.

Stay tuned. I'll be back next month!

How To Recognize Real World Software

Real world software should:

* Be simple to learn and use * Appeal to all ages * Be playful and charming * Not force you to learn or remember elaborate commands * Get you right to the action * Have a strong factual basis * Be accompanied by a substantial printed introduction to the skill or subject it teaches * Offer supplementary templates, databases, supplies, etc. * Offer powerful yet simple recordkeeping features to let you monitor your progress * Give you on-the-job, practical training in real-world skills * Encourage you to apply your new skills immediately in your daily life *

Charles Brannon
Program Editor

The Hush 80 CD Printer

We're not through with printers yet. Lately, dozens of manufacturers have flooded the market with low-cost, Commodore-compatible printers and printer interfaces. Since printers are one of the most popular peripherals after disk drives, we'll continue to bring you the latest information on this burgeoning business.

Thermal printers are an important part of the printer market. Although they sometimes pale in comparison to impact dot-matrix printers, they are unique in their low cost, high reliability, and low operating noise level. The Hush-80 scores high in these categories. It is an extremely attractive printer for the price, only $139.99. It prints on special thermal paper, which we've discussed in previous columns.

A thermal printer is very quiet compared to the racket of an impact printer. You can barely hear the Hush 80 print, the sound of the printhead brushing across the paper. The loudest sound is the faint grinding of the paper feed. You can press a small button to feed the paper one line, or hold it down to feed at high speed (although it sounds like an overworked sewing machine at this rate). You can hold down the button while you power-up the printer to print out a self-test.

It appears that manufacturers know what we want in a printer—full Commodore compatibility. That way everyone can use the same software without that software having to customize itself for your particular brand of printer. The Hush 80 CD has a built-in printer interface, so you don't need to buy one. It lets the printer display the full Commodore character set, including all graphics characters and reverse-video. The characters look like your average dot-matrix character set, not much like letter quality, but

The Hush 80 CD Printer

still quite readable. The printer is not slow, printing in both directions at 80 characters per second, although the actual printing speed is slower since it takes a little longer to feed the paper than on other printers.

The Hush 80 CD supports all the special features of the MPS-801 and 1525 printers, including graphics mode, double-width characters, and programmable tab settings. We've tried it with *SpeedScript* and some screen-dump software and had no problems. The only rule it doesn't follow is that reverse-field should automatically terminate at the end of a line. The Hush 80 stays in reverse-field mode until you send reverse-off. No big problem, unless you print a disk directory. You can edit out the reverse field if you LOAD "$",8 before printing the directory.

```
The complete HUSH 80 CD character set is fully Commodore compatible

 !"#$%&' ()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[£]↑←
 !"#$%&' ()*+,-./0123456789:;<=>?@abcdefghijklmno
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```

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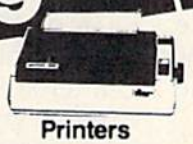

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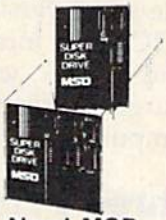

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This is a really small printer, smaller in size and length than a carton of cigarettes, and weighing only 25 ounces. The roll paper installs inside the printer, further making this a compact machine. In fact, I've set the printer up on top of the 1701 monitor, using no desk space at all. The disadvantage of thermal roll paper is clear. The thermal paper is rather glossy, and tends to darken as it ages (although it photocopies well). The roll paper makes word processing a little cumbersome. You have to manually tear off each sheet you print. For casual use or for printing program listings, though, roll paper is just fine.

The Hush 80 comes in several other configurations, either parallel or serial, with an optional battery pack. You could buy the Hush 80 with the Centronics parallel interface, then buy a parallel interface, and also use the printer with any computer with a Centronics interface. The serial version is for computers with an RS-232C serial interface. An optional rechargeable battery pack, which lasts 100,000 characters per charge, makes this an ideal printer for portable computers.

Three Printer Interfaces

Three new printer interfaces have arrived for evaluation since J. Blake Lambert's feature, "Selecting A Printer Interface" (August 1984). If you're looking for an interface for your non-Commodore printer, you might consider one of the following models. (Also, look for more printer interface information in the upcoming July GAZETTE.) All work with either the VIC or 64. Since the Plus/4 and Commodore 16 have redesigned cassette ports, the power required from the cassette port for most of these interfaces is not available.

MW-350

This rather large interface attaches like most Commodore interfaces. A round plug for the serial port attaches to either your computer or disk drive. You plug the printer cable from the interface into the Centronics port on the printer. (None of these interfaces can be used with an RS-232C serial printer.) The MW-350 attempts to draw the power needed to drive the interface from pin 18 on the printer. Not all printers supply the necessary voltage, though, so MicroWorld Electronix sells an optional power plug that plugs into the cassette port on the back of the computer. The cassette plug duplicates the cassette bus, so you can still use a tape drive.

This interface seems solidly built, with a metal serial port plug that snaps into place better than any plastic one I've seen. In emulation mode, the MW-350 simulates the features of the MPS-801 or 1525 printer. Since the MW-350 is a graphics interface, it uses the graphics mode of your printer to reproduce Commodore graphics and cursor symbols. The emulation mode honors all 1525/MPS-801 secondary addresses and commands for double width, graphic mode, tab stops, etc. It also reproduces reverse-field characters. A small set of switches is used to customize the interface for your printer, supporting most popular parallel printers. A listing mode translates the cryptic symbols used on the screen for cursor controls into readable words, similar to the GAZETTE's listing conventions. A transparent mode lets you send all codes directly to the printer without any translation between Commodore ASCII and true ASCII. Other printer codes specific to this interface let you set the left and right margin and forms length, and lock in any secondary address. By simply opening the case and plugging in RAM chips, you can add a 2K or 4K printer buffer.

What sets this interface apart is the excellent interface manual, written with the novice in mind. Although it will still require careful study, any casual computer user can easily get his printer working with a wide variety of software. If you're a programmer, there is detailed information on how to bypass the emulation mode and communicate directly with the printer. The manual is full of charts, figures, and pictures, though it lacks an index. My only complaint is that the manual is printed in light green on white. Pretty soon you begin to see red afterimages fluttering about the page.

Cardco Card/? B

One of the first printer interfaces for the VIC and 64, Cardco's Card/? (pronounced card-print) continues to evolve. The latest revision shrinks the electronics down to a large plug that fits directly into the printer. A cable connects to the computer's serial port, and a thin wire attaches to a cassette port module, removing any doubt about power availability.

This latest revision improves on MPS-801/1525 compatibility. Earlier models would not always transparently work with software designed for the MPS-801/1525. The Card/? B offers a listing mode where cursor controls are translated into words like [CLEAR]. However, the Card/? B does not offer graphics emulation, so it seems more useful as a lower cost alternative interface for printers lacking a graphics mode, including letter quality printers. A lockable transparent mode lets you use the Card/? B as a "dumb" interface. In transparent mode (sometimes called graphics mode), the interface only performs the serial-to-parallel conversion, and

does not interpret, intercept, or translate characters coming in. A transparent mode is required for certain word processors and graphics dump programs.

Cardco's manuals also keep improving, with expanded tutorials on BASIC printer programming, and tips for use with various printers. Several sample programs illustrate the features of the interface, including some utility programs for a screen dump and simulation of Commodore graphics characters.

TurboPrint/GT

It's hard to distinguish this interface's features from the others, but an optional 16K or 32K "TurboBuffer" makes this an extremely powerful model. Like the MW-350, the TurboPrint/GT is a graphics interface that works with most popular parallel printers. It can reproduce Commodore graphics and reverse video, and also offers a listing mode. However, this model does not *transparently* emulate the MPS-801 or 1525. It supports all the same codes and functions as the MPS-801/1525, but the same secondary addresses are not used. It has a lock mode that lets you force the interface to remain in a particular mode. The manual is not as tutorial or as readable as the other two interface manuals reviewed here, but does include a listing of a graphics screen dump program for the 64.

With the TurboBuffer, you can dump your text to the printer with no waiting. The buffer stores the text coming from the computer, then feeds it out to the printer. If you don't fill up the buffer, you can continue to use your computer while the printer chugs away.

Hush-80 CD
Ergo Systems, Inc.
2654 Eden Landing Road
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$139.99 for Commodore version (CD)

MW-350 Graphic Printer Interface
MicroWorld Electronix
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Note To Readers

The suggested retail price of the Blue Chip Electronics dot matrix printer reviewed in the March column is $240, plus $39.95 for the Commodore interface. We regret any confusion this may have caused readers.

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Michael S. Tomczyk

The Hidden Magic Of String Functions

This month, we'll reveal some real magicians' secrets—five unusual commands which are extremely important in BASIC programming, but which are seldom explained, even in reference guides. These commands are called *string functions*. They include: RIGHT$, LEFT$, MID$, STR$, and LEN.

Using String Commands

Examples to try:

```
LEFT$ (two symbols from left) A$="ABC":PRINT LEFT$(A$,2)
RIGHT$ (two symbols from right) A$="ABC":PRINT RIGHT$(A$,2)
MID$ (position 2, one character) A$="ABC":PRINT MID$(A$,2,1)
MID$ (random from string) A$="ABC":PRINT
MID$(A$,INT(RND(1)*3)+1,1)
LEN (length of string) A$="ABCDE":PRINT LEN(A$)
STR$ (remove leading space) A=17:A$=MID$(STR$(A),2):PRINT"$"A$
STR$ (numeric to string variable) A=17:A$=STR$(A):PRINT A$
STR$ (add zeros to numbers) A=17:PRINT STR$(A)+".00"
```

A Quick Review Of Variables

As you may recall from previous columns, there are two types of variables: *numeric* and *string*. Variables are short abbreviations used to stand for numbers, words, graphics, and other information.

Numeric variables are used to stand for numbers used in calculations and program commands. A numeric variable can be a letter (A,B,C) or a letter and another letter or number (A1,B3,X4,ZZ,CP). Here's a short program that defines the variable A1 as the number 10 and the variable A2 as the number 20, then adds them together and prints the result:

```
10 A1=10:A2=20:PRINT A1+A2
```

Type RUN and press RETURN. Using the PRINT command to add together the two variables causes the computer to display the result of the calculation.

String variables are used to abbreviate and manipulate string information—including words and letters, punctuation marks, graphics, colors, editing commands, and numbers not used in calculations. A string variable can be used to define any information which can normally be printed inside quotation marks. Here's a simple example (include one blank space after the S in COMPUTE!'S):

```
10 C$="COMPUTE!'S ":G$="GAZ
ETTE":PRINTC$+G$
```

Type RUN and press RETURN. Here, we define the string variable C$ as the word "COMPUTE!'S " and the variable G$ as "GAZETTE". We can add two or more string variables using a PRINT command and a plus sign (+). It's not really adding in the way numbers are added, so using a plus sign between strings is called "concatenation." Concatenating string variables has the effect of printing them side by side.

String variables have many uses. For example, here's a handy way to print lines on the screen (use 22 instead of 40 if you have a VIC):

```
10 G$="----------------------------------
   ------"
20 PRINTG$
```

There are many other ways to manipulate strings of information. Before we get into the individual string functions, here's a teaser:

```
10 A$="ABCDE"
20 PRINT A$
30 FOR X=5 TO 1 STEP-1: PRINT MID$(A$,X,1
   );: NEXT
```

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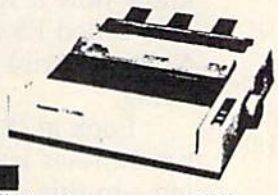

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How did we do that? Read on.

Using LEFT$ And RIGHT$

LEFT$ and RIGHT$ allow you to pick out parts of a string from the left or right side of the string, and print or manipulate the information. To show you how this works, let's create a variable in direct mode (just type it directly into your computer—the computer will hold the variable in its memory):

```
Y$="YESNO"
```

Now, you can use either LEFT$ or RIGHT$ to print all or part of this variable. Both commands work similarly. Type this command:

```
PRINT LEFT$(Y$,3)
```

The computer displays the word YES because the LEFT$ command tells the computer to print the leftmost three characters from the string variable Y$. Since we defined Y$ as "YESNO" the leftmost three characters are "YES" and that's what the computer displays. If we use the number 5 instead of the number 3 in parentheses, the computer will print the entire variable ("YESNO"). Now try this one:

```
PRINT RIGHT$(Y$,2)
```

The computer displays the word NO. The RIGHT$ command causes the computer to choose the two characters from the right side of the variable, which forms the word "NO."

LEFT$ and RIGHT$ are used in various types of word games as well as in practical applications such as analysis of address information. Here's a very short example to give you an idea how this works:

```
10 PRINT "{CLR}ENTER YOUR STATE AND ZIP C
   ODE, THEN PRESS RETURN.": INPUT A$
20 Z$=RIGHT$(A$,5)
30 PRINT "YOUR ZIP CODE IS "; Z$
```

In line 10 we start with a PRINT statement which clears the screen and asks the user to input a state and zip code. The entire "string" of information which is typed by the user is defined as a string variable, A$.

Line 20 creates a new string variable (Z$) as the five rightmost characters in the variable A$. Unless the user put a space or extra information at the end of the INPUT, Z$ should equal the five-digit zip code.

Line 30 displays a message (in quotes) and the zip code represented by the variable Z$. Notice that when we print string variables, the variables are *outside* quotation marks. Also, there is no "leading space" in front of the zip code number stored in Z$, so you have to leave a space after "IS" in line 30. Now, type NEW and press RETURN to get ready for the next example.

Using MID$ To Manipulate Strings

The MID$ command works like LEFT$ and RIGHT$ but is much more powerful because you can use it to pick out specific bits of information from any part of the string, not just the left or right side. Here's an example to show how it works:

```
10 P$="BESTEXAMPLE": PRINT MID$(P$,5,7)
```

Type RUN and press RETURN. This example looks more complicated than it really is. But, like most BASIC magic, it's easy once you know how it works. First, we create a string variable called P$ and define it as "BESTEXAMPLE". Next, we print the word EXAMPLE from our P$ string.

Look at the MID$ command. First, inside the parentheses is the name of the variable we're using—in this case, P$. Next comes the *position number*— here, the 5 tells the computer to start at the fifth position in the string, which is the letter E. The last number (7) determines the *length* of the information we're using from the string. Remember, the MID$ command requires the name of the variable, the position where we wish to start, and (optionally) the length of the information we wish to manipulate. Try this example:

```
10 A$="LEFTMIDDLERIGHT"
20 PRINT MID$(A$,1,4)
30 PRINT MID$(A$,5,6)
40 PRINT MID$(A$,11,5)
50 PRINT MID$(A$,1,15)
60 FOR X=7 TO 5 STEP-1: PRINT MID$(A$,X,1
   ): NEXT
```

Line 10 defines the variable A$ as the string "LEFTMIDDLERIGHT".

Line 20 prints a substring four characters long (length is 4) starting at the first character (position 1). The result is the word "LEFT".

Line 30 prints a substring which starts at the fifth position and displays six characters—the word "MIDDLE".

Line 40 prints a substring which starts at the eleventh position and displays five characters—the word "RIGHT".

Line 50 prints the entire string, starting at the first position and displaying all 15 characters.

Line 60 prints part of the string backwards. We start with a FOR-NEXT loop which steps backwards 1 position at a time, starting at position 7 and stepping down to positions 6 and 5 in order. The FOR-NEXT loop tells the computer where to start in the string, so we use the X variable from the FOR-NEXT loop in place of the position number in the MID$ command. The length is 1 because although we're printing three characters (positions 7 to 5, stepping backwards),

we're still printing one character each time. The result is that the seventh character (D) is printed, then the sixth character (I), then the fifth character (M). The result is "DIM"

Using MID$ To Check For Right Answers

One of the best and most powerful uses of MID$ is to check to see if an answer is correct. You can do this by scanning the input typed in by the user, and searching to see if a key letter, word, or phrase is included in the input. In the example that follows, we'll ask who wrote the book, *The Home Computer Wars*, and since the answer is me, we'll scan the input for my last name (Tomczyk) and then print a "right" or "wrong" message. Type NEW and press RETURN, then enter and run this program:

```
10 PRINT "{CLR}WHO WROTE 'THE HOME COMPUT
   ER WARS'": INPUT X$
20 FOR A=1 TO LEN(X$)
30 IF MID$(X$,A,7)="TOMCZYK" THEN GOTO 20
   0
40 NEXT A
50 PRINT "WRONG...TRY AGAIN.": FOR T=1 TO
    500: NEXT: GOTO 10
200 PRINT "RIGHT!"
```

Line 10 clears the screen and displays the opening message.

Line 20 is a FOR-NEXT loop which tells the computer to step through the input string, one character at a time—and uses the LEN command to tell the computer how far to step through the string. We'll get to the LEN command in a moment, but for now just remember that LEN (LENgth) calculates how many symbols or digits there are in a string of information, in this case, X$.

Line 30 uses the MID$ command to search for a group of seven characters (substring) which matches "TOMCZYK"—the right answer. Remember, the FOR-NEXT command tells the computer to step through the string, one character at a time. This MID$ command tells the computer to keep checking the next group of seven characters to see if they match our keyword. If the computer finds the keyword "TOMCZYK," then it goes to line 200 to print the "RIGHT!" message.

Line 40 completes the FOR-NEXT loop begun in line 20.

Line 50 contains the "WRONG" message. The program automatically drops down to this line if it doesn't encounter "TOMCZYK" in the user's answer.

Line 200 can be reached only if there is a match in line 30.

Let's try something else with MID$, this time using random numbers. Did you ever see a program with multicolored stripes in the opening title? The author probably used MID$—a nice bit of programming "magic" which you can use in your programs, too.

You already know you can include graphics and colors in a string—does that give you any ideas? Type this program and run it (VIC owners should substitute 22 in place of 40 in line 20). To get the colors in line 10, hold down the CTRL key and, at the same time, press each of the eight color keys in order on your keyboard. Reverse graphics symbols will appear where you typed each color command:

```
10 G$="{WHT}{BLK}{RED}{CYN}{PUR}{GRN}
   {BLU}{YEL}"
20 FOR X=1 TO 40
30 R=INT(8*RND(1))+1: PRINT MID$(G$,R,1)"
   {RVS} ";: NEXT
40 GOTO 10
```

Type RUN and press RETURN. To stop the program, hold down RUN/STOP and press RESTORE at the same time (RUN/STOP–RESET on the Plus/4 and 16).

Line 10 creates a string variable (G$) which contains eight keyboard color commands. Remember, color commands can be stored in a string variable just like letters and words.

Line 20 starts a FOR-NEXT loop which tells us the program is going to repeat 40 times all the actions between the FOR and NEXT commands.

Line 30 is the key line in this program. Remember, because of the FOR-NEXT loop in the previous line, all commands in line 30 will be repeated 40 times. So, first, we choose a random number from 1 to 8, using a random number formula. Next, we use the random number as the position number in the MID$ command. PRINT MID$(G$,R,1) means take the string of color commands from G$ (which we defined in line 10), choose a random position in the string (the same as choosing a random color), and then print that color command once. Next, we print a reverse space, which is the best way to display a solid square on the screen. The semicolon makes the colored squares appear horizontally, and the NEXT command ties up the end of the FOR-NEXT loop.

Line 40 is optional. Eliminating it prints only one multicolored bar across the screen.

Using The LENgth Of Strings

The LEN command, which determines how many characters there are in the string, is especially helpful in determining if someone has typed an input which is too long or too short. Try this:

```
10 A$="NINETEEN CHARACTERS"
20 PRINT LEN(A$)
```

Line 10 defines the string variable A$ as "NINETEEN CHARACTERS." Line 20 displays the length—how many characters or digits there are in the string—which (coincidentally) is 19 including the space between the two words. How can we use this information? For one thing, we can use it to center a title horizontally on the screen. Try this example (VIC owners should substitute 22 for 40 in line 20):

```
10 TL$="HOME COMPUTER WARS"
20 PRINT "{CLR}";: FOR C=1 TO (40-LEN(TL$
   ))/2: PRINT SPC(1);: NEXT: PRINT TL$
```

Line 10 creates a variable called TL$ and defines it as a title—in this case, another plug for my book, *The Home Computer Wars*. This can be any title within quotation marks. You can try other strings in line 10; they'll be centered on the screen.

Line 20 clears the screen. Since your computer automatically moves down one line whenever a new PRINT command is encountered, we use the semicolon to eliminate the linefeed. With the semicolon, the printed title appears on the first line. Without it, the title appears on the second line.

The FOR-NEXT loop uses the LEN command in a centering formula. Here's the way it works: First, it measures the length of the title (TL$), then subtracts the length of the title from the column width of the screen (40 for most Commodore computers or 22 for the VIC-20), then it divides the remainder in half and prints that many spaces at the beginning of the line. After calculating and printing the spaces needed to center the title, we print the title. Here's another version of the same program:

```
10 TL$="HOME COMPUTER WARS"
20 L=(40-LEN(TL$))/2
30 PRINT "{CLR}";: FOR C=1 TO L: PRINT SP
   C(1);: NEXT: PRINT TL$
```

The difference here is that we broke apart the program a bit and created a numeric variable (L), which is the same as the centering calculation which gives the number of spaces needed at the beginning of the title. Then, in line 30, we use the value of L in a FOR-NEXT loop to print the proper number of spaces in front of the centered title.

Error checking is also an excellent application of the LEN command. One way to tell if the correct information has been typed in is to measure the length of the input. Let's take a simple example—the entry of a two-digit code for a state:

```
10 PRINT "{CLR}ENTER A 2-DIGIT CODE FOR Y
   OUR STATE": INPUT W$
20 IF LEN(W$)>2 THEN PRINT"TOO LONG...RE-
   ENTER": FOR T=1 TO 500: NEXT: GOTO 10
30 IF LEN(W$)<2 THEN PRINT"TOO SHORT...RE
   -ENTER": FOR T=1 TO 500: NEXT: GOTO 10
```

Type RUN and press RETURN. Line 10 clears the screen and prints the opening prompt message, then asks for an input. (To see how the program works, try typing one letter, then try it again with three or more letters.)

Line 20 tells the computer that if the length of the state code typed in is larger than 2, then print the message "TOO LONG...RE-ENTER", pause for a "time delay count" to 500, then go back to line 10 for a new input.

Line 30 is the same as line 20 except here we measure whether the input is less than 2 digits, and print the "TOO SHORT" message.

Notice we used the greater than (>) and less than (<) symbols in lines 20 and 30.

You can use LEN to determine if a "string" of information is the proper length, but what about numbers? There's a way to check the length of numbers, too, but first you have to use another command—STR$.

The STR$ Command

The STR$ command performs *real* magic—it turns a numeric variable into a string variable. Try this:

```
10 A=10
20 A$=STR$(A)
30 PRINT A$
```

Line 10 creates a numeric variable (A) and defines it as the number 10.

Line 20 creates a string variable (A$) which contains the same characters as A. In other words, A equals the number 10 and A$ equals the *string* " 10". The difference between them is that the computer recognizes A as a number ten, which can be used in calculations. A$, on the other hand, is a string. The computer can't use it as a number—it's just a collection of characters.

To determine the length of a number for error-checking, you need to convert the number into a string variable using the STR$ command, then use the LEN command to check the length of the string and subtract 1. The reason we subtract 1 is because BASIC automatically puts a blank space in front of all positive numbers (to leave room for a minus sign if the result of a calculation is negative). The blank space gets carried over when you convert a numeric variable to a string variable, so, for example, converting A=10 to a string turns out like this: A$=" 10" with a space in front of the 10. Printing the length of the new variable A$ yields a three because the blank space is counted. To get the real digit length, you have to subtract one. Here's the example (it works on numbers up to nine digits long):

```
10 PRINT "ENTER A NUMBER": INPUT A
20 A$=STR$(A)
```

```
30 PRINT "THERE ARE" LEN(A$)-1 "DIGITS IN
   YOUR NUMBER."
```

What if you want to remove the blank space from the front of a number? There are many occasions when you don't want the blank space there, for example, when you want to print a dollar sign ($) right next to the number without a space in between. To see what we're talking about, here's what happens if you print a dollar sign in front of a number without removing the leading space:

```
10 PRINT "$"500
20 A=500: PRINT "$"A
```

Here's a handy technique for eliminating the space between the dollar sign and number:

```
10 A=500
20 A$=MID$(STR$(A),2)
30 PRINT "$"A$
```

Until I learned this trick, this problem used to drive me crazy with frustration. Finally, I asked a programmer friend for some help and he introduced me to the string functions discussed in this column. Notice that the MID$ function lacks the second number (the length of the substring), which we said was optional up above. If you omit the length, MID$ starts at the position specified and goes to the end of the string. In line 20, MID$ skips over the space to position 2 and reads all the rest of the string.

Here's another problem-solver. Did you ever notice that BASIC drops zeros off the end of numbers? For example, the number 5.00 is automatically converted to 5. Try it:

```
PRINT 5.00
```

But what if you want to keep the zeros, to represent dollars and cents? Here's how to put the zeros in:

```
10 PRINT "{CLR}ENTER A WHOLE NUMBER AND P
   RESS RETURN": INPUT N
20 N$=MID$(STR$(N),2) +".00"
30 PRINT N$
```

There are many more uses for the five BASIC commands we've covered in this column. String functions can help overcome quite a few programming obstacles and stumbling blocks, especially if you're a beginning programmer. Try experimenting with these string functions by combining them with other BASIC commands. You'll be surprised how much "magic" is contained in these few simple commands.

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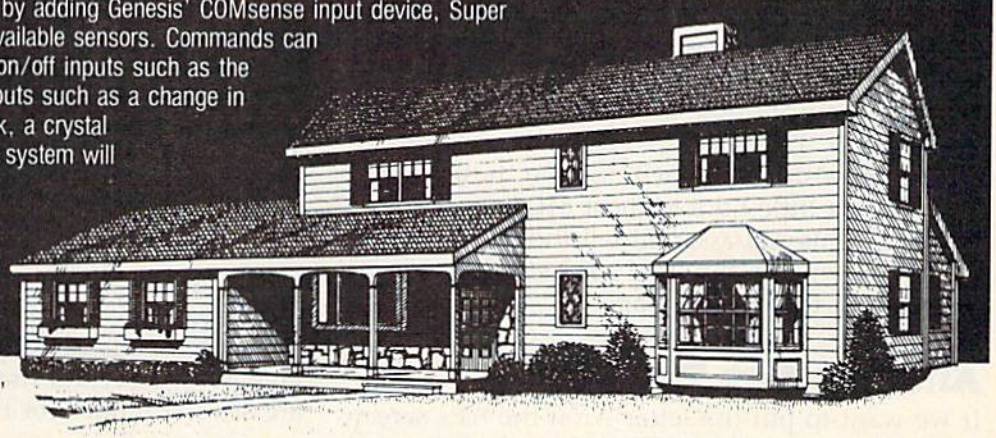

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MACHINE LANGUAGE FOR BEGINNERS

Richard Mansfield, Senior Editor

Getting And Sending

We recently received the following question in the mail: *Why do ML instructions have so many forms? Why, for example, does the ADC instruction have eight different modes, hence eight different opcodes?*

These different forms are called *addressing modes.* There are several ways to address most machine language (ML) instructions because that gives the programmer greater flexibility.

ML programming, at its most primitive level, amounts to supervising and designing pathways for numbers to fly around inside the computer during a program run. It's something like setting up an elaborate pattern with dominoes. When you tip over the first one, the rest of the action is fast, predictable, sometimes quite beautiful.

But you have to arrange things so that they go off at the right time and end up where they're supposed to. That's where addressing comes in. Instead of positioning each domino, however, you attach a little note to most ML instructions. This note, this *address,* will tell the instruction where to go when the time comes for it to do its little part in the overall plan.

Another Way To POKE

If we want to put the letter A on the 64's screen in BASIC, we would POKE 1024,1. In ML, we do something quite similar. We load the Accumulator with the number that will become the letter A when displayed on screen (LDA #1) and then send it to the proper address, the first location in screen RAM memory (STA 1024). ML breaks everything down into single steps, so it uses two instructions which BASIC combines into one:

POKE 1024,1 in BASIC becomes . . .

LDA #1
STA 1024 in machine language.

Let's look more closely at that second step. STA is the ML instruction, 1024 is the address. This 1024 is an unadorned number (without any commas, parentheses, or # signs which would change the meaning of that number in ML). The unadorned 1024 means that we have chosen to use an ML addressing *mode* called Absolute Addressing. It means that the number 1 will be sent directly to address 1024. If you address it differently, STA 1034, you will place the letter A ten spaces to the right on the screen. And, as we'll see shortly, you can choose some quite exotic ways to address your little packages. For example, 1024,Y is a special addressing mode called Indirect,Y, and it has its own special way of sending the letter A. More about Absolute and Indirect,Y Addressing in a minute.

If all this sounds alarming, recall that there are various modes in BASIC, too. It's just that you're probably already used to them and don't give them a second thought. For example, there are several modes for the PRINT command:

PRINT X
PRINT "X"
PRINT TAB (X)

In ML, there are a total of 13 possible addressing modes, but some of them are virtual duplications, some are intuitively obvious, and some are nearly useless. So, when faced with the

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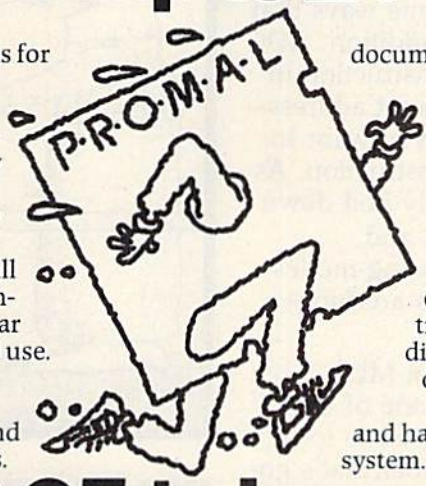

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(Sieve of Eratosthenes)

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task of understanding ML programming, it's good to separate the modes into these categories and learn to use the three important ones.

The Big Three

To learn the modes, let's explore some ways that we could choose to handle simple addition. ADC (ADd with Carry) is an important instruction in ML. Let's take a quick look at the eight addressing modes that are available when you want to add bytes together with the ADC instruction. As you'll see, these eight modes actually boil down to only three: Immediate, Absolute, and Indirect,Y. Remember: Some addressing modes are functionally identical and others are functionally useless.

1. **Immediate Mode**—written in ML programming as ADC #10. This is one of the most useful of all since you don't need to look anywhere else in RAM for the number that's going to be added to the number already in the Accumulator. Here's how you would add 5 + 10 using Immediate Mode addressing:

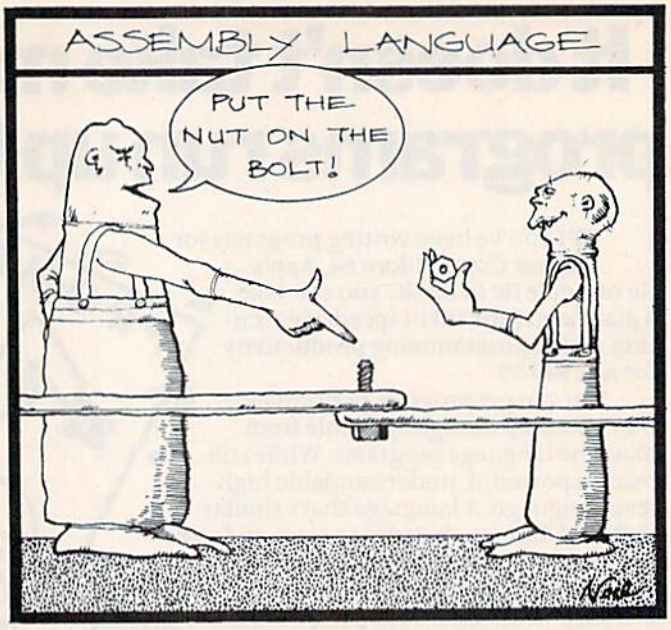
```
CLC; (always clear the carry before starting any
  addition)
LDA #5; (put 5 into the Accumulator)
ADC #10; (add 10)
```

That's it. If you execute this little ML program, you'll find that the accumulator now holds 15. (By the way, the semicolon tells the assembler to ignore what follows, it's just a comment. It works like REM in BASIC.)

As you see, Immediate Mode addressing is accomplished by simply putting the # symbol in front of a number. It means, "use this number right here" (as opposed to looking in RAM memory for the number). If you leave off the # (as in LDA 5) you would put *whatever number was currently in RAM memory location five* into the accumulator.

2. **Zero Page**—ADC 10—not too often used. It means add the number in the Accumulator to whatever number is currently in *RAM memory address 10.* This addressing mode can only deal with the first 256 bytes in the computer (a page is a 256-byte long chunk of memory; this is the lowest page in memory so it's called zero page).

This first page is very heavily used by the computer's operating system and by BASIC. It's the fastest memory addressing method, so the computer uses it for time-critical operations like the internal clock, fetching information from a BASIC program during a RUN, etc. You can't store your own ML programs in zero page without causing havoc. The only zero page addresses which you can use safely are 2, 251–254, and, if you're not using the Datassette during the ML program's execution, 163–177. That's not much



space. You'll want to store address pointers in these locations, however, because they assist with a very useful addressing mode called Indirect Y, which we'll get to in a minute.

3. **Zero Page,X**—ADC 10,X—practically useless. Here you add the number in the accumulator to whatever number is in address 10 + X. In other words, if the X Register holds a 6, you would add the number in the Accumulator to whatever number is in address *16.* Since this addressing mode has little known value (and none for beginning ML programmers), we'll bring any further discussion of it to a sudden halt.

4. **Absolute**—ADC 1000—you'll use this mode all the time. It addresses any memory location in the computer. It's straightforward, you just put the address after the instruction; no commas, no # symbols, no parentheses, just a simple number.

This example would add the number in the Accumulator to whatever number was currently in address 1000. Notice that it's difficult to tell the difference between this mode and zero page addressing. ADC 10 could be thought of as Absolute instead of zero page. However, your assembler will automatically detect if an address is lower than 256 and create the correct zero page mode opcode.

Especially For Loops

5. **Absolute,Y**—ADC 1000,Y. This is an "indexed" addressing mode and is very similar to Zero Page,X discussed above. Absolute,Y is, however, useful when you have a table of information in memory and want to access it quickly. For example, if you've previously stored the ages of all your friends in a table starting at address

1001, you could find the age of the fifth friend in the list by LDY #5: LDA 1000,Y since that would retrieve the number in address 1005. (The Y Register is added to the 1000 to produce the actual address used.)

This addressing mode is also useful if you want to move an entire block of memory to some other place. You could move a 256-byte-large block by setting up a simple loop and using the Y as an index:

Here, the labels SOURCEBYTE and TARGETADDRESS can be replaced by the actual addresses of your blocks. The point to notice is that you'll keep looping back to LOOP until Y counts up to 255, and then one additional trip through the loop will reset Y to 0 and you'll fall through the BNE (Branch if Not Equal to zero) instruction.

Want to move larger blocks? The whole screen, maybe? It's not hard:

```
        LDY #0
LOOP    LDA SOURCEBYTE,Y
        STA TARGETADDRESS,Y
        LDA SOURCEBYTE+256,Y
        STA TARGETADDRESS+256,Y
        INY
        BNE LOOP
```

This will move 512 bytes. For larger block moves, just stick in more LDA/STA pairs.

6. **Absolute,X**—ADC 1000,X. Exactly the same as Absolute,Y except you use the X Register as your index. Used the same way and for the same purposes.

7. **Indirect,X**—ADC (10,X)—fundamentally useless. Forget about this mode.

The Puzzler

8. **Indirect,Y**—ADC (10),Y. A very useful mode, but takes a bit of head scratching at first to see just what it does. In effect, you prearrange a little two-byte address in zero page (called a *pointer)* and then you bounce off that pointer (plus the Y Register) to the real target. Here's how we could move 256 blank characters to the screen on the 64 using Indirect,Y:

```
        TARGET = 1024; (address of the screen RAM)
        LDA #<TARGET; (load the low byte of the
                       target address)
        STA 251; (a safe place in zero page to hold our
                  pointer)
        LDA #>TARGET; (fetch the high byte of the
                       target address)
        STA 252; (store high byte into pointer)
        LDA #32; (the blank character)
        LDY #0; (set our index to zero)
LOOP    STA (251),Y; (bounce off the target+Y)
        INY
        BNE LOOP
```

Why, you might well ask, go to all the trouble of setting up this pointer when you can use the ordinary Absolute,Y to achieve the same result? Besides, Absolute is much easier to understand.

You have a point. But this Indirect,Y mode is faster and more flexible. For example, to move the whole show up 256 bytes, all you need to do is INC 252, which raises your pointer by 256. So, if you were sending a copy, an *image*, of a truly huge amount of memory to a disk, it might be easier to manipulate things with Indirect,Y. You can go ahead and program without this addressing mode, but it is a valuable tool and you'll likely end up learning to use it frequently. It solves some problems for the programmer in a most efficient way.

Its basic advantage is that Indirect,Y pointers are variable. They're not carved into your ML program like an Absolute address. Rather, they exist in ordinary RAM, outside your program, and you can fiddle with the pointer easily by storing new numbers into it, INC or DECing it, etc. Indirect,Y is a particularly flexible addressing mode once you get the hang of it. It's nice for keeping track of the position of players and enemies in games, and so forth.

Creatures From The Eleventh Dimension

As for the other advantage of Indirect,Y—that it's a faster addressing mode—don't bother worrying about speed. There are usually several ways to accomplish the same thing when programming. Some are more compact, some easier to understand, some faster. But, at the lightning speeds of ML, you need never worry about maximizing speed. Only Creatures from the Eleventh Dimension would ever be able to tell that your program was running five milliseconds slower than it might.

Most of the important ML instructions (STA, LDA, SBC, CMP, for example) can use all eight of these addressing modes we've discussed. There are other ML instructions which can use some, but not all of these modes. A few remaining instructions have weird modes of their own. Most of the time you can let your assembler help you. If you accidentally try to use a mode that's not available to a particular instruction, your assembler will alert you.

However, this covers most of what you'll need to know about addressing to get started programming effectively in ML. There are 13 modes altogether, but the five we've not discussed are either obvious and require no special attention from the programmer (INY uses a mode called *implied* addressing because you give no address, you're just raising the Y Register by 1) or are virtually never used (Zero Page,Y).

Understanding Sorts

Arieh Shamash

With a short sort routine, your Commodore computer can easily alphabetize and organize a list of words or numbers. This tutorial explains three different types of BASIC sorts, and offers program examples. A hi-res screen display graphically illustrates the results. For the VIC, 64, Plus/4, and 16.

If the second value is less than the first, then you put the first in a temporary variable, put the second in the first, and the temporary first value into the second. But if the first is less, don't switch them. Either way, increase the counter and the sort continues.

Confused? Don't be. The following programs can help you understand three different algorithms: the bubble sort, the shell sort, and the quicksort. (An algorithm is a set of procedures for solving a problem.)

Before getting started, VIC and 64 owners should read the special instructions for entering the programs. Owners of the Plus/4 and 16 can just type the programs and save to tape or disk.

Special VIC Instructions

The three VIC programs are written for an unexpanded VIC. To protect BASIC from the hi-res graphics, you must enter this line before loading and running each program:

```
POKE6144,0:POKE44,24:NEW
```

Type in the programs, save them to tape or disk, and (before loading the programs) enter the POKEs above.

Special 64 Instructions

Before typing the three sort programs, enter "Hi-Res Routine" (Program 4), and save it. This routine is necessary; the other three 64 programs won't work without it. While the Hi-Res Routine is still in memory, enter and save "Bubble Sort" (Program 5). Next type NEW, load the previously saved copy of Hi-Res Routine, and enter and save the next program "Shell Sort." Repeat this procedure for the final program, loading Hi-Res Routine before entering and saving "64 Quicksort."

A Visible Sort

Go ahead and run each of the programs; we'll learn how they work a little later. The bubble sort should be run first because it's the slowest. The shell sort works about four times faster. And the quicksort is faster yet, taking about half as much time as the shell sort.

The computer needs a few seconds to set up and clear the high-resolution screen. It also makes up an array containing 99 random numbers ranging from 1 to 99. Due to memory and screen limitations, the VIC sorting programs use 75-element arrays.

The first thing you see is a galaxy of dots scattered across the screen. Each line going across the screen corresponds to one of the variables in the array. So if variable L%(1) holds the value 1, there's a dot in the upper-left corner. If L%(2) holds a 50, its corresponding dot is in the middle of the second line from the top.

A properly sorted and organized array would appear as a roughly diagonal line running from the top left to the bottom right. Each of the sorting routines transforms the chaotic mess of random dots into a diagonal line.

When the sort is finished, press any key to continue. The screen will display the number of items sorted and the time used. Running a sort program more than once may result in different times, depending on the initial distribution of the random numbers.

Comparing And Trading

The way most sorts work is by comparing two items in an array and trading them if they're out of order. In each of the three programs is a line that looks something like this:

```
IF L%(T) > L%(T+1) THEN TE = L%(T): L%(T) =
L%(T+1): L%(T+1) = TE
```

The variable T points to an element in the array. If it happens to hold the value 4, then L%(4) is compared to L%(4+1). The fourth number in the array is compared to the fifth. If item four is greater than number five, they're out of order and need to be switched. The value in L%(4) is put into the variable TE (an abbreviation for temporary), the value from L%(4+1) slides over into L%(4), and the value from TE goes into L%(4+1).

So, if necessary, the program trades the values in the two variables, putting them into order. By comparing and trading over and over, the list is eventually put into order.

If the first number is less than the second, no trading is necessary, of course, and the sort continues with the next item on the list.

The Slow, Reliable Bubble

The slowest of the three sorts is the bubble sort. It's usually the first sorting algorithm taught to beginning programmers, because it's fairly easy to understand. This is how it works:

```
10 FORI=S-1TO1STEP-1:FORT=1TOI
20 IFL%(T)>L%(T+1)THENTE=L%(T):L%(T)=L%(T
   +1):L%(T+1)=TE
30 NEXT:NEXT
```

This is sorting at its simplest—a compare/trade line inside two loops. The variable S is the size of the array. The outer I-loop counts backwards (STEP −1) from one less than the size (S − 1) down to one. The inner T-loop counts forward from one to the value of I.

Let's trace a bubble sort through a few comparisons. We'll start with an array of nine unsorted numbers. Since the size (S) of the list is nine, the outer I-loop begins at S − 1, which is 8. The inner loop counts from one up to I (8), comparing and trading.

First pass (I = 8)

1	2	3	4	5	6	7	8	9	T
58	**69**	91	7	12	37	97	65	89	1
58	**69**	**91**	7	12	37	97	65	89	2
58	69	**91**	**7**	12	37	97	65	89	3
58	69	7	**91**	**12**	37	97	65	89	4
58	69	7	12	**91**	**37**	97	65	89	5
58	69	7	12	37	**91**	**97**	65	89	6
58	69	7	12	37	91	**97**	**65**	89	7
58	69	7	12	37	91	65	**97**	**89**	8
58	**69**	**7**	**12**	**37**	**91**	**65**	**89**	**97**	

The bold numbers are the ones being compared. A bubble sort is methodical: Is item 1 (58) greater than item 2 (69)? No, don't trade them. Next, compare items 2 and 3. They're OK, don't trade. Now compare item 3 (91) against item 4 (7)—91 is greater, so they get traded.

After eight comparisons, the largest number (97) has fallen to its proper position (item 9). As the second pass begins, the I-loop changes the value of I from 8 to 7. The inner T-loop will now count 1 to 7. On the third pass, T counts 1 to 6, then 1 to 5, and so on.

Notice how the small numbers move toward the top of the list one spot at a time. This contributes to the relatively slow speed of the bubble sort. But the real inefficiency appears in longer lists. Bubble sorting nine items takes 36 comparisons (8 + 7 + 6 + 5 + 4 + 3 + 2 + 1). If you double the size of the list to 18, the number of comparisons more than quadruples, to 153.

Multiplying the size of the list by two means multiplying the time used by four. Bubble sorting a long list can take hours.

The More Efficient Shell

If you've already tried the hi-res shell sort program, you've probably noted that the dots move in a different pattern (compared to the bubble sort). And it finishes the sort in one-fourth the time. (This procedure is named after its inventor, Donald Shell.) When you strip away the random numbers and hi-res routines, it looks like this:

```
10 G=INT(S/2)
20 N=0:FORI=1TOS-G
30 IFL%(I)>L%(I+G)THENT=L%(I):L%(I)=L%(I+
   G):L%(I+G)=T:N=1
```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```
40 NEXT:IFN=1THEN20
50 G=INT(G/2):IFG>=1THEN20
```

It works like a bubble sort, but with a twist. Line 30 compares and trades, but instead of comparing neighbors, it looks further down the list. The variable L%(I) is checked against L%(I+G). G starts as half the length (S) of the list and is reduced by half in later loops. The variable N flags a trade. If a comparison causes a trade, N = 1 and the loop is repeated. If no trades have happened, N = 0 and G is cut in half.

If we use a shell sort on the list of nine numbers from above, it looks like this:

```
 1   2   3   4   5   6   7   8   9   I
pass one (gap G = 4)
58  69  91   7  12  37  97  65  89   1
12  69  91   7  58  37  97  65  89   2
12  37  91   7  58  69  97  65  89   3
12  37  91   7  58  69  97  65  89   4
12  37  91   7  58  69  97  65  89   5
pass three (gap G = 2)
12  37  91   7  58  69  97  65  89   1
12  37  91   7  58  69  97  65  89   2
12   7  91  37  58  69  97  65  89   3
12   7  58  37  91  69  97  65  89   4
12   7  58  37  91  69  97  65  89   5
12   7  58  37  91  69  97  65  89   6
12   7  58  37  91  65  97  69  89   7
12   7  58  37  91  65  89  69  97
```

The list contains nine items, so the gap G starts at four (half of nine, rounded down). Item 1 (58) is compared to item 5 (12) and traded. Item 2 (69) is traded with item 6 (37), and so on down the list. Since there was at least one trade on the first pass, the flag N equals one and the gap G stays at four. On the second pass, nothing is traded, so N=0 and G is reduced by half, to two.

On the third pass, we compare items 1 against 3, 2 against 4, 3 against 5, and so on. As soon as there are no more trades, G is reduced by half again. The process continues until G is less than 1.

A bubble sort moves things one spot at a time. The shell sort is faster because the elements of the array are transferred longer distances.

But long lists are still a problem. If the size of the list doubles, the sorting time approximately triples. It's not as long as the bubble sort, but the extra time adds up. What we need is a method where doubling the list only doubles the time.

Quicksort: Divide And Conquer

The quicksort algorithm looks quite complicated:

```
10 DIML%(S),S%(20)
20 S%(1)=1:S%(2)=S:P=2
30 L=S%(P):P=P-1:F=S%(P):P=P-1:I=F
40 J=L:D=L%((F+L)/2)
50 IFL%(I)<DTHENI=I+1:GOTO50
60 IFL%(J)>DTHENJ=J-1:GOTO60
70 IFI<=JTHENT=L%(I):L%(I)=L%(J):L%(J)=T:
   I=I+1:J=J-1
80 IFI<=JTHEN50
90 IFF<JTHENP=P+1:S%(P)=F:P=P+1:S%(P)=J
100 F=I:IFF<LTHEN40
110 IFP<>0THEN30
```

The list is still in L%, but there's a new array (S%) which acts like a stack, keeping track of which sections are being sorted. The variable P is a pointer, used by the array S%(P). You'll also notice F and L (first and last), I and J (indexes to the list L%), and D (dividing line).

The comparisons happen in lines 50 and 60; values are traded in 70.

To understand the quicksort, imagine a well-shuffled deck of cards you want to put in order. Pick a dividing line. It could be anything, but let's use nine. Any card less than nine goes in one pile, cards greater than (or equal to) nine are put in a second pile. Now forget about the first bunch of cards (you'll look at them later). The second group is divided again, this time using queens. You put nines through jacks in one pile, queens and kings in another. Now sort the queens and kings. When they're done, go back to the other cards.

The list is broken down into smaller and smaller categories, until you reach a point where only one or two items remain:

```
 1    2    3    4    5    6    7    8    9
(midpoint D is #5: 12)
58   69   91    7   12   37   97   65   89   1
12   69   91    7   58   37   97   65   89   2
(midpoint D is #6: 37)
12    7 / 91   69   58   37   97   65   89   3
(midpoint D is #6: 91)
12    7 / 37 / 69   58   91   97   65   89   4
12    7 / 37 / 69   58   89   97   65   91   5
(midpoint D is #8: 97)
12    7 / 37 / 69   58   85   65 / 97   91   6
(midpoint D is #5: 58)
12    7 / 37 / 69   58   89   65 / 91   97   7
(midpoint D is #6: 89)
12    7 / 37 / 58 / 69   89   65 / 91   97   8
12    7 / 37 / 58 / 69   65 / 89   91   97
```

The list has nine numbers, so the middle is item 5 (containing a 12). This is the first midpoint. Starting at the left, look for a number greater than (or equal to) 12. The first number (58) works, so now we go to the end of the list. We need a number less than (or equal to) 12. It turns out to be 12. Now switch the two.

The index, I, moves forward, J moves backward. The next number (69) is more than 12, so J

moves backward to find a number less than 12 (7). The two are traded. As soon as the indexes cross, we pick a new midpoint.

The numbers 12 and 7 are at the beginning of the list, in a separate "pile" to be sorted later.

The next dividing line is the number halfway between item 3 and item 9 (3 + 9 is 12, and 12/2 is 6, so the halfway point is item 6, containing a 37). Only one exchange takes place, and 37 is put into a pile all by itself. Forget about 37 for now, we have to sort elements 4–9. Now the midpoint is item 6 (91). Two numbers are traded.

The numbers 69, 58, 89, and 65 are put aside for later. Now, 91 and 97 are put in order. Since we're at the end of the list, we have to go back to the previous piles.

After just eight trades, the last three numbers are in the correct place, and the beginning of the list has been subdivided into manageable piles containing just one or two numbers.

Quicksort lives up to its name—it is quick. And if the size of the list is doubled, the sorting time increases by slightly more than double, making it the best choice for long lists.

Alphabetizers And Pointers

The three different ways of sorting can be used to alphabetize string arrays as well. Less-than, greater-than, and equals can be used to compare words. The letter A is less than B, for example, because its ASCII value is smaller. (For a complete list of ASCII values, see the appendix in the User's Guide).

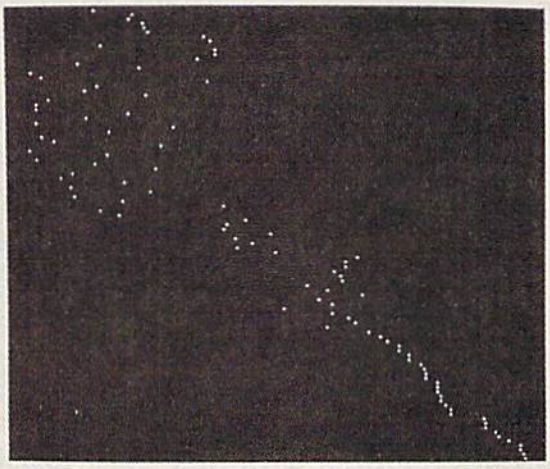
The compare/trade method used in these programs is called "replacement sorting," because when two items are out of order, they trade places on the list. When the program is done, the list is in order.

In some lists (an address file, for example) you may want to sort by different fields. One sort would be alphabetical by last name, another would be in zip code order. The algorithm you would use—bubble, shell, or quick—would be similar, but you would leave the list intact and sort pointers:

```
A$(1)="D"     B(1)=2
A$(2)="A"     B(2)=4
A$(3)="C"     B(3)=3
A$(4)="B"     B(4)=1
A$(5)="E"     B(5)=5
```

The list on the left is scrambled, but the pointers are in order. A$(2) ("A") should be first at the top of the list, so the pointer B(1) holds a 2. To print them in order, **FORT=1TO5: PRINTA$(B(T)):NEXTT**. The compare/trade routine would have to change to something like this:

```
IF L%(B(T)) > L%(B(T+1)) THEN TE = B(T): B(T) =
B(T+1): B(T+1) = TE
```



The hi-res screen illustrates the process of sorting. Here, "Quicksort" has finished organizing the last third of the list (lower right-hand corner).

You still compare two numbers in the first array (L%, in this case), but if they're out of order, you trade values in the second array (B(T)). Before the sort starts, you have to initialize the pointers: **FORT=1TOS: B(T)=T: NEXT.**

Using a pointer sort and relative disk files, an unexpanded VIC-20 could alphabetize a list of 1000 strings, far more than would ordinarily fit into memory.

See program listings on page 121.

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Searchlight

Katherine Myers

You can save time with this short machine language routine that spotlights errors in BASIC programs. A good tool for debugging programs you've written or those you've typed in. For the VIC and 64.

Your program comes to an abrupt halt and the words SYNTAX ERROR IN 50 are on the screen. You list line 50 and study it time and again wondering where the problem lies. Why, with all the amazing speed and power of your computer, won't it show you where your error is?

I know I've spent many hours, especially when I first got my computer, staring at lines I thought were written correctly and wondering where that error was. If you've spent too much time searching for errors, this program is for you.

"Searchlight" is written in machine language (in the form of a BASIC loader) and is easy to use. Type in the program, save a copy, and run it before you load or start typing the program you'll be working on.

A Safe Section Of Memory

It first asks you for the starting address so you can locate it where it won't interfere with your program or any other machine language utilities in memory. It's only 121 bytes long, so it will fit in the cassette buffer. Of course, if you're using tape, this would be inappropriate.

It's important to put the program somewhere safe in memory where BASIC cannot interfere with it. Here are some suggestions for a starting address: Disk users can use 828 (the beginning of the cassette buffer on both the VIC and 64). On the 64, you can use the 4K section at 49152–53247 (remember to allow for 121 bytes); 50000 would work, and it's easy to remember. If you have a VIC and tape drive, you'll have to put it in a protected area of BASIC memory. Before running Searchlight, follow these instructions:

1. Enter **TM=PEEK(55)+256*PEEK(56):SA=TM-121:PRINTSA** and write down the number which will be the starting address.

2. Next, move the top of memory down with **HB=INT(SA/256):LB=SA-256*HB:POKE55,LB:POKE56,HB:CLR**

These two lines will work on a VIC (unexpanded or expanded) or a 64.

Line 20 of the 64 version is written for the user's protection—it prevents the program from being inappropriately located—to screen RAM, for example. It also won't let you locate it in an address below 820 or in ROM. Since the VIC's screen memory and BASIC move around, depending on the amount of expansion, the VIC version does not check for inappropriate starting addresses.

After choosing a location, the loader POKEs in the data for the machine language routine and erases itself with the NEW command if all the data entered is correct. Be sure to note the location you first selected as you'll have to SYS to it.

Putting It Into Action

When you wish to use Searchlight, SYS to the address you've chosen before you run your program. I usually put the SYS command in the first line of the program I'm testing so I don't have to type it in each time. When you run a program and an error is encountered, type LIST. The line which contains the error will be listed with an arrow pointing to the appropriate place in the code. For example, it may be in a spot where some code is missing, to a place where you're trying to go to a nonexistent line number, and so on. If the arrow is placed in a statement that contains parentheses, check to see if there is an equal number of open and closed parentheses. If there isn't an arrow in the statement listed, the error is at the end of the line. After Searchlight lists an erroneous statement and it is corrected, run the program again. If another error exists, this, too, will be listed. Keep running it until the program is free of errors.

Any time RUN/STOP–RESTORE is used, Searchlight is deactivated. This is programmed for user convenience—you don't have to turn off the machine or remember any POKEs. Also, RUN-STOP acts like a TRACE function. Press RUN-STOP when a program is running, and an "error" appears on the line that is executing. This can be useful in testing and debugging.

When you make a correction, be sure to delete the arrow before pressing RETURN. If you don't, the arrow will become part of the BASIC line in which it appears.

Certain errors, like those encountered during an INPUT statement (EXTRA IGNORED and REDO FROM START, for example) will not activate Searchlight since these are user errors and not problems related to a program line. Also, the program will not indicate errors encountered during statements entered in direct mode.

This program can save many hours of searching for errors—especially when you're dealing with long lines. You can use it for your own programs or those you type in from a magazine. It's especially helpful when typing in a program since it points to the place in the line where you need to look. You won't have to start from the beginning of that line when comparing your version with the printed copy.

See program listings on page 127.

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Also Included: **ReportGen, ReportMerge** (interface W/P with Database to create form letters, statements, invoices, mailing labels, other reports.); **Baseball Statistician** (compiles batting statistics for a baseball league); several W/P utilities, including **Index** (indexes W/P's text files); several Database utilities, including **DBmerge** (facilitates multi-file database applications.), AND **DBStat** (analyzes D/B files); a programming utility, **ASCII,** which converts text files (program listings) into program files; also **Checkbook**; **Inventory**; **Paper Route**; **Loan Analysis**; **Breakeven Analysis**; **Depreciation**; **Labeler**; more.

Versions of the package are available for any and every Commodore computer having a minimum of 10k RAM (does it say 'Commodore' on it? How about on the box it came in?) Add $3 if you have an 8050 disk drive. All programs will fully support tape, disk, and printer. The package is available on disk or tape (disk version only for Plus4™ and 16™.) Price includes documentation and shipping within USA and Canada; all other countries, add $5 (no personal checks from outside USA). No charge cards. For C.O.D., enclose $5 fee; Calif. residents add 6%. This ad is the catalog.

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How To Type In *COMPUTE!'s GAZETTE* Programs

Each month, COMPUTE!'s GAZETTE publishes programs for the VIC-20, Commodore 64, Plus 4, and 16. Each program is clearly marked by title and version. Be sure to type in the correct version for your machine. Also, carefully read the instructions in the corresponding article. This can save time and eliminate any questions which might arise after you begin typing.

We publish two programs, which appear periodically, designed to make your typing effort easier: The Automatic Proofreader, and MLX, designed for entering machine language programs.

When entering a BASIC program, be especially careful with DATA statements as they are extremely sensitive to errors. A mistyped number in a DATA statement can cause your machine to "lock up" (you'll have no control over the computer). If this happens, the only recourse is to turn your computer off then back on, erasing whatever was in memory. So be sure to *save a copy of your program before you run it.* If your computer crashes, you can always reload the program and look for the error.

Special Characters

Most of the programs listed in each issue contain special control characters. To facilitate typing in any programs from the GAZETTE, use the following listing conventions.

The most common type of control characters in our listings appear as words within braces: {DOWN} means to press the cursor down key; {5 spaces} means to press the space bar five times.

To indicate that a key should be *shifted* (hold down the SHIFT key while pressing another key), the character is underlined. For example, A means hold down the the SHIFT key and press A. You may see strange characters on your screen, but that's to be expected. If you find a number followed by an underlined key enclosed in braces (for example, {8 A}), type the key as many times as indicated (in our example; enter eight SHIFTed A's). To type {SHIFT-SPACE}, hold down the SHIFT key and press the space bar.

If a key is enclosed in special brackets, [ ], hold down the Commodore key (at the lower left corner of the keyboard) and press the indicated character.

Rarely, you'll see a single letter of the alphabet enclosed in braces. This can be entered on the Commodore 64 by pressing the CTRL key while typing the letter in braces. For example, {A} means to press CTRL-A.

The Quote Mode

Although you can move the cursor around the screen with the CRSR keys, often a programmer will want to move the cursor under program control. This is seen in examples such as {LEFT}, and {HOME} in the program listings. The only way the computer can tell the difference between direct and programmed cursor control is *the quote mode.*

Once you press the quote key, you're in quote mode. This mode can be confusing if you mistype a character and cursor left to change it. You'll see a reverse video character (a graphics symbol for cursor left). In this case, you can use the DELete key to back up and edit the line. Type another quote and you're out of quote mode. If things really get confusing, you can exit quote mode simply by pressing RETURN. Then just cursor up to the mistyped line and fix it.

When You Read:	Press:	See:
{CLR}	SHIFT + CLR/HOME	
{HOME}	CLR/HOME	
{UP}	SHIFT + CRSR ↑	
{DOWN}	CRSR ↑	
{LEFT}	SHIFT + CRSR →	
{RIGHT}	CRSR →	
{RVS}	CTRL + 9	
{OFF}	CTRL + 0	
{BLK}	CTRL + 1	
{WHT}	CTRL + 2	
{RED}	CTRL + 3	
{CYN}	CTRL + 4	

When You Read:	Press:	See:
{PUR}	CTRL + 5	
{GRN}	CTRL + 6	
{BLU}	CTRL + 7	
{YEL}	CTRL + 8	
{F1}	f1	
{F2}	SHIFT + f1	
{F3}	f3	
{F4}	SHIFT + f3	
{F5}	f5	
{F6}	SHIFT + f5	
{F7}	f7	
{F8}	SHIFT + f7	

When You Read:	Press:	See:
←	←	
↑	SHIFT + ↑	

For Commodore 64 Only

When You Read:	Press:	See:
[1]	C= + 1	
[2]	C= + 2	
[3]	C= + 3	
[4]	C= + 4	
[5]	C= + 5	
[6]	C= + 6	
[7]	C= + 7	
[8]	C= + 8	

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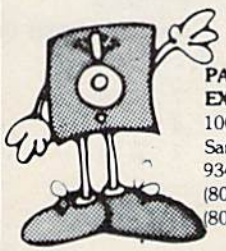

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MLX Machine Language Entry Program

For Commodore 64 And VIC-20

Charles Brannon, Program Editor

MLX is a labor-saving utility that allows almost fail-safe entry of machine language programs published in GAZETTE. You need to know nothing about machine language to use MLX—it was designed for everyone. There are separate versions for the Commodore 64 and expanded VIC-20 (at least 8K).

MLX is a new way to enter long machine language (ML) programs with a minimum of fuss. MLX lets you enter the numbers from a special list that looks similar to BASIC DATA statements. It checks your typing on a line-by-line basis. It won't let you enter illegal characters when you should be typing numbers. It won't let you enter numbers greater than 255 (forbidden in ML). It won't let you enter the wrong numbers on the wrong line. In addition, MLX creates a ready-to-use tape or disk file. You can then use the LOAD command to read the program into the computer, as with any program:

LOAD "filename",1,1 (for tape)
LOAD "filename",8,1 (for disk)

To start the program, you enter a SYS command that transfers control from BASIC to machine language. The starting SYS number always appears in the appropriate article.

Using MLX

Type in and save MLX (you'll want to use it in the future). When you're ready to type in an ML program, run MLX. MLX asks you for two numbers: the starting address and the ending address. These numbers are given in the article accompanying the ML program.

You'll see a prompt corresponding to the starting address. The prompt is the current line you are entering from the listing. It increases by six each time you enter a line. That's because each line has seven numbers—six actual data numbers plus a *checksum number*. The checksum verifies that you typed the previous six numbers correctly. If you enter any of the six numbers wrong, or enter the checksum wrong, the computer rings a buzzer and prompts you to reenter the line. If you enter it correctly, a bell tone sounds and you continue to the next line.

MLX accepts only numbers as input. If you make a typing error, press the INST/DEL key; the entire number is deleted. You can press it as many times as necessary back to the start of the line. If you enter three-digit numbers as listed, the computer automatically prints the comma and goes on to accept the next number. If you enter less than three digits, you can press either the SPACE bar or RETURN key to advance to the next number. The checksum automatically appears in inverse video for emphasis.

To simplify your typing, MLX redefines part of the keyboard as a numeric keypad:

```
  U I O              7 8 9
H J K L   become 0   4 5 6
  M , .              1 2 3
```

MLX Commands

When you finish typing an ML listing (assuming you type it all in one session) you can then save the completed program on tape or disk. Follow the screen instructions. If you get any errors while saving, you probably have a bad disk, or the disk is full, or you've made a typo when entering the MLX program itself.

You don't have to enter the whole ML program in one sitting. MLX lets you enter as much as you want, save it, and then reload the file from tape or disk later.

MLX recognizes these commands:

SHIFT-S: Save **SHIFT-N: New Address**
SHIFT-L: Load **SHIFT-D: Display**

When you enter a command, MLX jumps out of the line you've been typing, so we recommend you do it at a new prompt. Use the Save command to save what you've been working on. It will save on tape or disk, as if you've finished, but the tape or disk won't work, of course, until you finish the typing. Remember what address you stop at. The next time you run MLX, answer all the prompts as you did before, then insert the disk or tape. When you get to the entry prompt, press SHIFT-L to reload the partly completed file into memory. Then use the New Address command to resume typing.

To use the New Address command, press SHIFT-N and enter the address where you previously stopped. The prompt will change, and you can then continue typing. Always enter a New Address that matches up with one of the line numbers in the special listing, or else the checksum won't work. The Display command lets you display a section of your typing. After you press SHIFT-D, enter two addresses within the line number range of the listing. You can abort the listing by pressing any key.

What if you forgot where you stopped typing? Use the Display command to scan memory from the beginning to the end of the program. When you reach the end of your typing, the lines will contain a random pattern of numbers. When you see the end of your typing, press any key to stop the listing. Use the New Address command to continue typing from the proper location.

See program listings on page 127.

Password Protection For BASIC Programs

Shawn K. Smith

If you've discovered a clever timesaving technique or a brief but effective programming shortcut, send it to "Hints & Tips," c/o COMPUTE!'s GAZETTE. If we use it, we'll pay you $35. Due to the volume of items submitted, we regret that we cannot always reply individually to submissions.

Bulletin boards, telecommunication services, and business computers often require users to enter a password before they're allowed access to the system. Password protection prevents unauthorized persons from getting into the computer.

Have you ever wanted to add a password to a BASIC program? It's not very hard. You may have programs you don't want a younger brother or sister to use. Or, in a business situation, you may want to keep certain employees from playing around with important programs.

Password protection is *not* the same as copy protection. Copy protection prevents people from making backups, sometimes called "pirated" or "bootleg" copies, of commercial programs. Adding a password routine doesn't affect loads or saves. Users can still copy a program that requires a password, but the copy won't do them much good unless they know the secret code.

A Simple Password

The first scheme is so simple, it will work only with small children and users who know nothing about BASIC. Let's say you've chosen the password "UNIQUE". Add these lines to your program:

```
10 PRINT "ENTER PASSWORD": INPUT A$
20 IF A$ <> "UNIQUE" THEN PRINT "SORRY":
   GOTO10
30 (program continues)
```

Let's call this a "level 1" password routine. The user inputs a string variable (A$) and the program checks it against the word UNIQUE. If A$ doesn't match, the program loops back to line 10. You could replace GOTO10 with NEW to erase the program when the password is wrong.

The obvious problem is that if someone loads the program and types LIST, he'll see the password. Then, he types RUN and enters UNIQUE.

We need a LIST preventer, to keep the password secret.

Stopping LIST

Entering shifted characters in a REM statement can give strange results. For example, REM (SHIFT-F) will LIST as REM ASC. Most are translated into BASIC keywords. But one of the shifted letters has a curious effect: SHIFT-L makes a program listing stop and print ?SYNTAX ERROR. Add this line to the above program:

```
15 REM (SHIFT-L)
```

If your computer is in upper/lowercase mode, you'll see a capital L after the REM. In uppercase/graphics mode, the SHIFT-L character looks like an expanded capital L character.

Type LIST, and lines 10 and 15 print, but not 20. The listing stops with a SYNTAX ERROR. (By the way, if you use SHIFT-L in your disk ID, it makes the directory unlistable to you or anyone else). The SHIFT-L trick can also be used when you're programming and want listings to stop at a certain line.

A smart user could do one of two things. Since line 15 has some sort of problem, he or she could enter LIST16- (try it). There's the password, for all the world to see. Or, just delete 15

by entering 15 and pressing RETURN. LIST will now reveal the secret word.

Can we change the line number so the computer thinks it is line 15, but the user thinks it is something else?

A False Line Number

Move the cursor to a blank line, hold down the SHIFT key, and press the INST/DEL key. Now type an unshifted INST/DEL. The INSerT key puts you into insert mode, which is almost identical to quote mode. But you can delete in quote mode, while insert mode displays a delete as a reversed letter T. Here's how to put deletes into a REM statement:

1. Enter 15 REM"" (note there are two pairs of quotation marks).
2. Use the DELete key to erase the second quotation mark.
3. Type CTRL-9 (RVS ON) followed by seven unshifted T's.
4. Now enter 30 REM, a quotation mark, and a SHIFT-L.

The reverse T's act like delete keys and erase the previous seven characters when listed. The 30 REM is then printed. LISTing the program makes it look like line 30 follows line 10, when it is really line 15. An unauthorized user who tries to list past 30 or delete line 30 won't see the password at line 20.

A REM followed by a quotation mark and the right number of reverse T's can also be added to the end of a regular BASIC line to cover up variables (the password, for example) or to mislead users who list the program. This is about as far as we can go with password routine number one, though. Now let's look at a different type of password program.

Twisting The Line Links

BASIC lines are stored in memory according to definite rules. A few PEEKs will illustrate how the rules work.

First, type NEW and enter this line: 10 REMAB. Then type the following line without a line number:

```
B=PEEK(43)+256*PEEK(44):PRINTB:FORI=BTOB+9:
  PRINTI,PEEK(I):NEXT
```

Locations 43 and 44 are a pointer to the first memory location used by BASIC. 43 holds the low byte, which is added to 256 times the high byte (in location 44). On a 64, for example, the numbers 1 and 8 are contained in the pointer. And 1+256*8 is 2049, where the BASIC program starts. After you press RETURN, you'll see the following numbers (64 only—VIC, Plus/4, and 16 will be similar):

2049	9	low line link
2050	8	high line link
2051	10	low line number
2052	0	high line number
2053	143	token for REM
2054	65	ASCII value of A
2055	66	ASCII value of B
2056	0	zero: end of line
2057	0	two zeros: end of program
2058	0	

The line link points to the beginning of the next BASIC line. Like the pointer at 43–44, it is stored in low/high format. The same formula tells you where to find the next line, 9+(8*256), which is 2057. If there were another line in memory, 2057 and 2058 would contain the line link.

The line links work like stepping stones—the first link points to the second, the second points to the third, and so on. You'll always find a zero in between lines, just before a line link. The last line link in the program points to the first of two zeros. So, three zeros in a row mark the end of the program.

Putting zeros into the first line link will prevent users from listing or running the program, unless they know the correct POKEs:

1. List the program to make sure it's in memory.
2. Enter B = PEEK(43) + 256*PEEK(44): PRINTB. Write down the number.
3. Now PRINT PEEK(B), PEEK(B+1) and write down the two numbers.
4. Type POKEB,0:POKEB+1,0 and LIST.

The program's gone. But you can save to tape or disk and load the seemingly invisible program back into memory. A couple of POKEs—the numbers you wrote down—and the program is back.

Numeric Password

There are a couple of variations on the line link changer. Type NEW and enter this program:

```
10 PRINT "PASSWORD": INPUT S,L,H: POKE S,L:
   POKE S+1,H
20 PRINT "HELLO."
```

LIST it, to see that the program is in memory. Now, enter this line in immediate mode:

```
B=PEEK(43)+256*PEEK(44):FORJ=B+5TOB+80:
  PRINT-J*(PEEK(J-1)=0);:NEXT
```

The screen should fill with a lot of zeros (and a few other numbers). Write down the first number that's not a zero. Call it the key location.

Let's say it's 2090 (if it's something else, use that number instead). That means the line link for the next line (line 20) can be found in 2090–2091. Next, enter PRINT PEEK(2090), PEEK(2091) and write down the numbers. In this example, they might be 57 and 8, depending on the spacing in lines 10 and 20.

Finally, POKE 2090,0: POKE 2091,0 (if your key location is different, use that number instead of 2090). Changing the line links to zero makes listing past that point impossible. If you list the program, all you'll see is line 10. If you know the three number password, you can make the program work.

Type RUN and enter the three numbers, separated by commas. In this example, your password would be 2090,57,8. The POKEs in line 10 fix the line link, restoring the program to normal.

An Infinite Program

Remember that locations 43 and 44 point to the first line link, and the first line link points to the second. What would happen if we changed the first line link to point to itself? Let's try it. Type NEW and enter a short program:

```
10 REM FIRST LINE
20 REM SECOND LINE
FL=PEEK(43)+256*PEEK(44):PRINTFL,PEEK(FL),
    PEEK(FL+1)
```

Write down the three numbers and then enter POKE FL, PEEK(43): POKEFL+1, PEEK(44). The first line link now points to itself. Try to list the program and you'll see line 10 printed over and over. After listing the first line, the computer checks the line link for the next line in memory. The link points to itself, so the first line is listed again and again, almost as if the program were infinitely long.

To get the program back, change the line link back to what it was by POKEing the numbers you wrote down.

Let's take this a step further. As we saw above, a REM followed by a quotation mark and reversed T's (working as deletes) can make a line invisible to someone trying to list it. If you use this trick to make the first line invisible, then twist the line link to point to itself, LIST will seem to be disabled. The computer will print an infinite number of invisible lines.

A combination of the above techniques can protect your programs from most prying eyes. These tricks are not perfect, however. A good machine language programmer could probably bypass these routines. If you can invent a password protection system, someone else can probably figure out how you did it. The best program security is still a lock and key.

Understanding Sorts

(Article on page 110.)

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

Program 1: VIC Bubble Sort

See instructions in article before typing.

```
1 V=36864:M=4096:H=248:W=7680:R=38400:GOT
  O4                                :rem 213
2 Z=(YANDH)*15+Y+(XANDH)+M:POKEZ,PEEK(Z)O
  RT%(XAND7):RETURN                 :rem 175
3 Z=(YANDH)*15+Y+(XANDH)+M:POKEZ,PEEK(Z)A
  NDNOTT%(XAND7):RETURN             :rem 211
4 FORI=0TO7:T%(7-I)=2↑I:NEXT:POKEV+1,37:P
  OKEV+3,32                         :rem 74
5 FORI=MTO6143:POKEI,0:NEXT:POKEV+5,252:P
  OKEV,11:POKEV+2,144               :rem 249
6 POKEV+15,27:FORI=0TO255:POKEW+I,I:POKER
  +I,6:NEXT                         :rem 170
7 S=75:DIML%(S)                     :rem 92
8 FORT=1TOS:L%(T)=RND(0)*S:X=L%(T):Y=T:GO
  SUB2:NEXT:TI$="000000"            :rem 80
9 FORI=S-1TO1STEP-1:FORT=1TOI       :rem 148
10 IFL%(T)>L%(T+1)THENGOSUB15:TE=L%(T):L%
   (T)=L%(T+1):L%(T+1)=TE           :rem 114
11 NEXT:NEXT:T$=TI$:POKE198,0       :rem 49
12 GETA$:IFA$=""THEN12              :rem 233
13 PRINT"{CLR}":POKEV+5,240:POKEV,5:POKEV
   +1,25:POKEV+2,150:POKEV+3,46     :rem 8
14 PRINTS"ITEMS SORTED IN":PRINTMID$(T$,3
   ,2)":"RIGHT$(T$,2)".":END        :rem 136
15 Y=T:X=L%(T):GOSUB3:Y=T+1:X=L%(T+1):GOS
   UB3                              :rem 208
16 Y=T:X=L%(T+1):GOSUB2:Y=T+1:X=L%(T):GOS
   UB2:RETURN                       :rem 233
```

Program 2: VIC Shell Sort

See instructions in article before typing.

```
1 V=36864:M=4096:H=248:W=7680:R=38400:GOT
  O4                                :rem 213
2 Z=(YANDH)*15+Y+(XANDH)+M:POKEZ,PEEK(Z)O
  RT%(XAND7):RETURN                 :rem 175
3 Z=(YANDH)*15+Y+(XANDH)+M:POKEZ,PEEK(Z)A
  NDNOTT%(XAND7):RETURN             :rem 211
4 FORI=0TO7:T%(7-I)=2↑I:NEXT:POKEV+1,37:P
  OKEV+3,32                         :rem 74
5 FORI=MTO6143:POKEI,0:NEXT:POKEV+5,252:P
  OKEV,11:POKEV+2,144               :rem 249
6 POKEV+15,27:FORI=0TO255:POKEW+I,I:POKER
  +I,6:NEXT:S=50                    :rem 217
7 DIML%(S):FORT=1TOS:L%(T)=RND(0)*S:X=L%(
  T):Y=T:GOSUB2:NEXT:TI$="000000":G=INT(S
  /2)                               :rem 38
8 N=0:FORI=1TOS-G                   :rem 53
9 IFL%(I)>L%(I+G)THENGOSUB16:T=L%(I):L%(I
  )=L%(I+G):L%(I+G)=T:N=1           :rem 183
10 NEXT:IFN=1THEN8                  :rem 140
11 G=INT(G/2):IFG>=1THEN8           :rem 237
12 T$=TI$:POKE198,0                 :rem 64
```

```
13 GETA$:IFA$=""THEN13                    :rem 235
14 PRINT"{CLR}":POKEV+5,240:POKEV,5:POKEV
   +1,25:POKEV+2,150:POKEV+3,46           :rem 9
15 PRINTS"ITEMS SORTED IN":PRINTMID$(T$,3
   ,2)":"RIGHT$(T$,2)".":END              :rem 137
16 Y=I:X=L%(I):GOSUB3:Y=I+G:X=L%(I+G):GOS
   UB3                                    :rem 209
17 Y=I:X=L%(I+G):GOSUB2:Y=I+G:X=L%(I):GOS
   UB2:RETURN                             :rem 234
```

Program 3: VIC Quicksort

See instructions in article before typing.

```
1 V=36864:M=4096:H=248:W=7680:R=38400:GOT
  O4                                      :rem 213
2 Z=(YANDH)*15+Y+(XANDH)+M:POKEZ,PEEK(Z)O
  RT%(XAND7):RETURN                       :rem 175
3 Z=(YANDH)*15+Y+(XANDH)+M:POKEZ,PEEK(Z)A
  NDNOTT%(XAND7):RETURN                   :rem 211
4 FORI=0TO7:T%(7-I)=2↑I:NEXT:POKEV+1,37:P
  OKEV+3,32                               :rem 74
5 FORI=MTO6143:POKEI,0:NEXT:POKEV+5,252:P
  OKEV,11:POKEV+2,144                     :rem 249
6 POKEV+15,27:FORI=0TO255:POKEW+I,I:POKER
  +I,6:NEXT                               :rem 170
7 S=75:DIML%(S),S%(20)                    :rem 179
8 FORT=1TOS:L%(T)=RND(0)*S:X=L%(T):Y=T:GO
  SUB2:NEXT:TI$="000000":S%(1)=1:S%(2)=S:
  P=2                                     :rem 176
9 L=S%(P):P=P-1:F=S%(P):P=P-1:I=F:rem 161
10 J=L                                    :rem 52
11 D=L%((F+L)/2)                          :rem 20
12 IFL%(I)<DTHENI=I+1:GOTO12              :rem 173
13 IFL%(J)>DTHENJ=J-1:GOTO13              :rem 182
14 IFI<=JTHENGOSUB24:T=L%(I):L%(I)=L%(J):
   L%(J)=T:I=I+1:J=J-1                    :rem 30
15 IFI<=JTHEN12                           :rem 147
16 IFF<JTHENP=P+1:S%(P)=F:P=P+1:S%(P)=J
                                          :rem 77
17 F=I                                    :rem 52
18 IFF<LTHEN10                            :rem 86
19 IFP<>0THEN9                            :rem 91
20 T$=TI$:POKE198,0                       :rem 63
21 GETA$:IFA$=""THEN21                    :rem 233
22 PRINT"{CLR}":POKEV+5,240:POKEV,5:POKEV
   +1,25:POKEV+2,150:POKEV+3,46           :rem 8
23 PRINTS"ITEMS SORTED IN":PRINTMID$(T$,3
   ,2)":"RIGHT$(T$,2)".":END              :rem 136
24 Y=I:X=L%(I):GOSUB3:Y=J:X=L%(J):GOSUB3
                                          :rem 238
25 Y=I:X=L%(J):GOSUB2:Y=J:X=L%(I):GOSUB2:
   RETURN                                 :rem 7
```

Program 4: 64 Hi-Res Routine

See instructions in article before typing.

```
100 M=8192:GOSUB500:GOTO150               :rem 71
110 Z=M+INT(Y/8)*320+INT(X/8)*8+(YAND7)
                                          :rem 195
120 POKEZ,PEEK(Z)ORT%(XAND7):RETURN
                                          :rem 255
130 Z=M+INT(Y/8)*320+INT(X/8)*8+(YAND7)
                                          :rem 197
140 POKEZ,PEEK(Z)ANDNOTT%(XAND7):RETURN
                                          :rem 36
150 FORI=0TO7:T%(7-I)=2↑I:NEXT            :rem 77
160 SYS49152:POKE53272,PEEK(53272)OR8:POK
    E53265,PEEK(53265)OR32                :rem 160
500 X=0:FORI=49152TO49190:READA:X=X+A:POK
    EI,A:NEXT                             :rem 114
510 IFX<>6678THENPRINT"ERROR IN DATA STAT
    EMENTS.":STOP                         :rem 195
520 RETURN                                :rem 119
530 DATA 169,32,133,252,162,32,169
                                          :rem 141
540 DATA 0,168,145,251,200,208,251
                                          :rem 128
550 DATA 230,252,202,208,246,169,4
                                          :rem 136
560 DATA 133,254,170,160,0,169,16 :rem 85
570 DATA 145,253,200,208,251,230,254
                                          :rem 230
580 DATA 202,208,246,96                   :rem 116
```

Program 5: 64 Bubble Sort

See instructions in article before typing.

```
170 S=99:DIML%(S)                         :rem 195
180 FORT=1TOS:L%(T)=RND(0)*S*3+12:X=L%(T)
    :Y=2*T:GOSUB110:NEXT:TI$="000000"
                                          :rem 88
190 FORI=S-1TO1STEP-1:FORT=1TOI           :rem 245
200 IFL%(T)>L%(T+1)THENGOSUB250:TE=L%(T):
    L%(T)=L%(T+1):L%(T+1)=TE              :rem 212
210 NEXT:NEXT:T$=TI$:POKE198,0            :rem 98
220 GETA$:IFA$=""THEN220                  :rem 75
230 POKE53265,PEEK(53265)AND223:PRINT"
    {CLR}":POKE53272,21                   :rem 115
240 PRINTS"ITEMS SORTED IN "MID$(T$,3,2)"
    :"RIGHT$(T$,2)".":END                 :rem 242
250 Y=2*T:X=L%(T):GOSUB130:Y=2*(T+1):X=L%
    (T+1):GOSUB130                        :rem 204
260 Y=2*T:X=L%(T+1):GOSUB110:Y=2*(T+1):X=
    L%(T):GOSUB110:RETURN                 :rem 227
```

Program 6: 64 Shell Sort

See instructions in article before typing.

```
170 S=99:DIML%(S),M%(S)                   :rem 5
180 FORT=1TOS:L%(T)=RND(0)*S*3+12:X=L%(T)
                                          :rem 119
190 M%(T)=2*T:Y=M%(T):GOSUB110:NEXT:TI$="
    000000":G=INT(S/2)                    :rem 148
200 N=0:FORI=1TOS-G                       :rem 143
210 IFL%(I)>L%(I+G)THENGOSUB280:T=L%(I):L
    %(I)=L%(I+G):L%(I+G)=T:N=1            :rem 68
220 NEXT:IFN=1THEN200                     :rem 25
230 G=INT(G/2):IFG>=1THEN200              :rem 122
240 T$=TI$:POKE198,0                      :rem 115
250 GETA$:IFA$=""THEN250                  :rem 81
260 POKE53265,PEEK(53265)AND223:PRINT"
    {CLR}":POKE53272,21                   :rem 118
270 PRINTS"ITEMS SORTED IN "MID$(T$,3,2)"
    :"RIGHT$(T$,2)".":END                 :rem 245
280 Y=M%(I):X=L%(I):GOSUB130:Y=M%(I+G):X=
    L%(I+G):GOSUB130                      :rem 76
290 Y=M%(I):X=L%(I+G):GOSUB110:Y=M%(I+G):
    X=L%(I):GOSUB110:RETURN               :rem 99
```

Program 7: 64 Quicksort

See instructions in article before typing.

```
170 S=99:DIML%(S),M%(S),S%(20)            :rem 92
180 FORT=1TOS:L%(T)=RND(0)*S*3+12:X=L%(T)
                                          :rem 119
190 M%(T)=2*T:Y=M%(T):GOSUB110:NEXT:TI$="
    000000":S%(1)=1:S%(2)=S:P=2           :rem 70
200 L=S%(P):P=P-1:F=S%(P):P=P-1:I=F
                                          :rem 250
210 J=L:D=L%((F+L)/2)                     :rem 82
```

```
220 IFL%(I)<DTHENI=I+1:GOTO220      :rem 15
230 IFL%(J)>DTHENJ=J-1:GOTO230      :rem 24
240 IFI<=JTHENGOSUB330:T=L%(I):L%(I)=L%(J
    ):L%(J)=T:I=I+1:J=J-1           :rem 127
250 IFI<=JTHEN220                   :rem 245
260 IFF<JTHENP=P+1:S%(P)=F:P=P+1:S%(P)=J
                                    :rem 126
270 F=I:IFF<LTHEN210                :rem 190
280 IFP<>0THEN200                   :rem 228
290 T$=TI$:POKE198,0                :rem 120
300 GETA$:IFA$=""THEN300            :rem 73
310 POKE53265,PEEK(53265)AND223:PRINT"
    {CLR}":POKE53272,21             :rem 114
320 PRINTS"ITEMS SORTED IN "MID$(T$,3,2)"
    :"RIGHT$(T$,2)".":END           :rem 241
330 Y=M%(I):X=L%(I):GOSUB130:Y=M%(J):X=L%
    (J):GOSUB130                    :rem 102
340 Y=M%(I):X=L%(J):GOSUB110:Y=M%(J):X=L%
    (I):GOSUB110:RETURN             :rem 125
```

Program 8: Plus/4 and 16 Bubble Sort

```
10 S=99:DIML%(S):LIST4,7,1:LIST0,1:LIST1,
   2:WAIT1,1
20 FORT=1TOS:L%(T)=RND(0)*S*3+12:X=L%(T):
   Y=2*T:PRINT1,X,Y:NEXT:TI$="000000"
30 FORI=S-1TO1STEP-1:FORT=1TOI
40 IFL%(T)>L%(T+1)THENGOSUB70:TE=L%(T):L%
   (T)=L%(T+1):L%(T+1)=TE
50 NEXT:NEXT:T$=TI$:POKE239,0
60 GET/A$:WAITS0,1:PRINTS"ITEMS SORTED IN
    "MID$(T$,3,2)":"MID$(T$,5,2)".":END
70 Y=2*T:X=L%(T):PRINT0,X,Y:Y=2*(T+1):X=L
   %(T+1):PRINT0,X,Y
80 Y=2*T:X=L%(T+1):PRINT1,X,Y:Y=2*(T+1):X
   =L%(T):PRINT1,X,Y:RETURN
```

Program 9: Plus/4 and 16 Shell Sort

```
10 S=99:DIML%(S),M%(S),S%(20):LIST4,7,1:L
   IST 0,1:LIST1,2:WAIT 1,1
20 FORT=1TOS:L%(T)=RND(0)*S*3+12:X=L%(T)
30 M%(T)=2*T:Y=M%(T):PRINT1,X,Y:NEXT:TI$=
   "000000":S%(1)=1:S%(2)=S:P=2
40 L=S%(P):P=P-1:F=S%(P):P=P-1:I=F
50 J=L:D=L%((F+L)/2)
60 IFL%(I)<DTHENI=I+1:GOTO60
70 IFL%(J)>DTHENJ=J-1:GOTO70
80 IFI<=JTHENGOSUB150:T=L%(I):L%(I)=L%(J)
   :L%(J)=T:I=I+1:J=J-1
90 IFI<=JTHEN60
100 IFF<JTHENP=P+1:S%(P)=F:P=P+1:S%(P)=J
110 F=I:IFF<LTHEN50
120 IFP<>0THEN40
130 T$=TI$:POKE239,0
140 GET/A$:WAITS0,1:PRINTS"ITEMS SORTED I
    N "MID$(T$,3,2)":"MID$(T$,5,2)".":END
150 Y=M%(I):X=L%(I):PRINT0,X,Y:Y=M%(J):X=
    L%(J):PRINT0,X,Y
160 Y=M%(I):X=L%(J):PRINT1,X,Y:Y=M%(J):X=
    L%(I):PRINT1,X,Y:RETURN
```

Program 10: Plus/4 and 16 Quicksort

```
10 S=99:DIML%(S),M%(S):LIST4,7,1:LIST 0,1
   :LIST1,2:WAIT 1,1
20 FORT=1TOS:L%(T)=RND(0)*S*3+12:X=L%(T)
30 M%(T)=2*T:Y=M%(T):PRINT1,X,Y:NEXT:TI$=
   "000000":G=INT(S/2)
40 N=0:FORI=1TOS-G
50 IFL%(I)>L%(I+G)THENGOSUB100:T=L%(I):L%
   (I)=L%(I+G):L%(I+G)=T:N=1
60 NEXT:IFN=1THEN40
70 G=INT(G/2):IFG>=1THEN40
80 T$=TI$:POKE239,0
90 GET/A$:WAITS0,1:PRINTS"ITEMS SORTED IN
    "MID$(T$,3,2)":"MID$(T$,5,2)".":END

100 Y=M%(I):X=L%(I):PRINT0,X,Y:Y=M%(I+G):
    X=L%(I+G):PRINT0,X,Y
110 Y=M%(I):X=L%(I+G):PRINT1,X,Y:Y=M%(I+G
    ):X=L%(I):PRINT1,X,Y:RETURN
```

Charlemagne's Sword

(Article on page 52.)

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

Program 1: Charlemagne's Sword—64 Version

```
10 POKE53281,0:PRINT"{8}":C=54272:SQ=1912
                                    :rem 59
20 MU=54272:FORN=MUTOMU+24:POKEN,0:NEXT:P
   OKEMU+24,15:POKEMU+5,129:POKEMU+6,129
                                    :rem 138
30 POKEMU+12,129:POKEMU+13,129:POKEMU+4,6
   5:POKEMU+2,200:POKEMU+11,33      :rem 61
40 PRINTCHR$(8):POKE53280,0:GOSUB820:REM
   {SPACE}TITLES                    :rem 137
50 PRINT"{CLR}{3 DOWN}{4 SPACES}NUMBER OF
    PLAYERS (1-6)";:FORZ=1TO3:POKEMU+8,30
   :GOSUB1060:NEXT                  :rem 80
60 INPUTNP$:NP=VAL(NP$):IFNP<1ORNP>6THEN5
   0                                :rem 222
70 DIML$(19):{2 SPACES}REM L$ DIM FOR LEN
   GTH OF LONGEST WORD;S$ - NUMBER OF WOR
   DS                               :rem 54
80 DIM DI$(9,6),WO$(80),S$(30):FORN=1TO9:
   FORR=1TO6:READA$:DI$(N,R)=A$:NEXT:NEXT
                                    :rem 175
90 PL=1:FORN=1TO30:READA$:S$(N)=A$:NEXT:A
   $=""                             :rem 156
100 FOR JI=1 TO 6:HC(JI)=1.41:NEXT:REM HA
    NDICAP SCORE                    :rem 71
110 ER$="{47 SPACES}"               :rem 206
120 FORR=1TONP:Q=1                  :rem 116
130 FORZ=1TO3:POKEMU+8,30:POKEMU+1,15:GOS
    UB1060:NEXT                     :rem 9
140 PRINT"{2 DOWN}{10 SPACES}HIT '←' TO Q
    UIT"                            :rem 0
150 PRINT"{DOWN}"SPC(14)"{RVS}PLAYER"PL:P
    RINT"{2 DOWN}{2 SPACES}DO YOU WANT TO
```

```
    USE {RVS}D{OFF}ICE OR {RVS}W{OFF}ORD
    S";                                 :rem 34
160 INPUTQ$:Q$=LEFT$(Q$,1):IFQ$="D"THENL=
    9:GOSUB640:                         :rem 124
170 IFQ$="W"THEN GOSUB780               :rem 194
180 IFQ$<>"W"ANDQ$<>"D"ANDQ$<>"←"THENPRIN
    T"{6 UP}":GOTO150                   :rem 208
190 IFQ$="←"THENGOTO480                 :rem 130
200 PRINT"{HOME}{22 DOWN} TIME:{2 SPACES}
    {28 E}{HOME}"                       :rem 196
210 PRINT"{HOME}{4 DOWN}{2 SPACES}";:FORN
    =1TOL:PRINTL$(N)" ";:NEXT:PRINT
                                        :rem 87
220 POKE161,0:PRINT"{HOME}{9 DOWN}";
                                        :rem 169
230 K=PEEK(161)                         :rem 43
240 POKESQ+K,160:POKESQ+K+C,1:IF K>23 THE
    N POKE 53280,2                      :rem 101
250 GETL$:GOSUB1210:IFL$=CHR$(13)THENGOSU
    B400:L$="":GOTO300                   :rem 5
260 IFL$=CHR$(20)THENIFLEN(A$)>0THENA$=LE
    FT$(A$,LEN(A$)-1):IFLEN(A$)=0THENA$="
    "                                   :rem 30
270 POKE53280,0                         :rem 38
280 IFL$=CHR$(19)THENL$=""              :rem 178
290 PRINTL$;:GOSUB1160:IFL$<>""THENPOKEMU
    +1,10:FORN=1TO10:NEXT:GOSUB1080
                                        :rem 18
295 IF L$=CHR$(20) THEN 310             :rem 83
300 A$=A$+L$                            :rem 53
310 IFK<>27THEN230                      :rem 21
320 FORZ=1TO2:POKEMU+1,80:POKEMU+8,45:GOS
    UB1070:NEXT                         :rem 18
330 PRINT"{HOME}{22 DOWN}{2 SPACES}";ER$
                                        :rem 230
340 POKE 198,0:PRINT"{HOME}{22 DOWN}
    {3 SPACES}ANY CHALLENGES (Y/N)?
    {10 SPACES}"                        :rem 124
350 GETC$:IFC$<>"Y"ANDC$<>"N"THEN350
                                        :rem 51
360 IFC$="N"THENGOSUB440                :rem 165
370 IFC$="Y"THENGOTO540                 :rem 107
380 PL=PL+1:IFPL>NPTHENPL=1             :rem 230
390 NEXTR:GOTO120                       :rem 51
400 WO$(Q)=A$:Q=Q+1:A$=""               :rem 55
410 PRINT " ";                          :rem 161
420 FORR=12TO30:POKEMU+1,R:POKEMU+8,R*2:N
    EXT:GOSUB1080                       :rem 158
430 RETURN                              :rem 119
440 REM SCORE DISPLAY                   :rem 14
450 FORN=1TOQ:J=LEN(WO$(N)):IF LEN(WO$(N)
    )=0 THEN470                         :rem 35
460 SC(PL)=SC(PL)+INT(HC(PL)↑J)         :rem 100
470 NEXT:FORN=1TOQ:WO$(N)="":NEXT       :rem 72
480 PRINT"{CLR}{2 DOWN}{9 SPACES}WORD SEA
    RCH SCORES:{DOWN}"                  :rem 46
490 FORR=1TONP                          :rem 133
500 PRINT"{DOWN}{6 SPACES}PLAYER"R"
    {2 SPACES}"SC(R)                    :rem 19
510 NEXT:IFQ$="←"THENPRINT"{2 DOWN}
    {5 SPACES}THAT'S ALL, FOLKS!{BLK}":EN
    D                                    :rem 6
520 RETURN                              :rem 119
530 FORN=1TO3000:NEXT:RETURN            :rem 52
540 REM CHALLENGE                       :rem 0
550 PRINT"{HOME}{22 DOWN}{3 SPACES}WHICH
    {SPACE}WORD{12 SPACES}{11 LEFT}";
                                        :rem 157
560 INPUTCH$                            :rem 218
570 PRINT"{UP}{3 RIGHT}IS CHALLENGE CORRE
    CT (Y/N)?"                          :rem 236
575 GET R$:IF R$="" THEN 575            :rem 135
578 Y$=R$                               :rem 212
580 IF Y$<>"Y"ANDY$<>"N" THEN570        :rem 231
590 IFY$="N"THENPRINT"{UP}{37 SPACES}":GO
    TO340                               :rem 20
600 FORQQ=75TO0STEP-2:POKEMU+1,QQ:POKEMU+
    8,QQ:NEXT:GOSUB1080                 :rem 163
610 FORN=1TOQ:IFCH$=WO$(N)THENWO$(N)="":
                                        :rem 159
620 NEXT:PRINT"{UP}{35 SPACES}":GOTO340
                                        :rem 125
630 END                                 :rem 112
640 PRINT"{CLR}"SPC(14)"PLAYER"PL :rem 71
650 PRINT"{DOWN}{2 SPACES}YOUR DICE ROLL:
                                        :rem 50
660 PRINT"{4 SPACES}";:FORN=1TO9:L$(N)=DI
    $(N,RND(.)*6+1)                     :rem 130
670 NEXT:LD=9                           :rem 28
680 GOSUB690:RETURN                     :rem 215
690 FOR C1=1 TO 9:IF L$(C1)="Q" THEN GOSU
    B710                                :rem 91
700 NEXT:RETURN                         :rem 240
710 FOR C2=1 TO 9:IF L$(C2)="U" THEN RETU
    RN                                  :rem 34
720 NEXT                                :rem 216
730 IF C1<3 THEN C3=C1+2:GOTO750 :rem 206
740 C3=C1-2                             :rem 33
750 L$(C3)="U":RETURN                   :rem 195
760 GETR$:IFR$="" THEN760               :rem 127
770 RETURN                              :rem 126
780 PRINT"{CLR}"SPC(14)"PLAYER"PL:A=RND(.
    )*30+1                              :rem 80
790 PRINT"{DOWN}{2 SPACES}YOUR WORD IS:
                                        :rem 193
800 PRINT"{4 SPACES}";:FORN=1TOLEN(S$(A))
    :L$(N)=MID$(S$(A),N,1):NEXT         :rem 139
810 L=LEN(S$(A)):LD=L:RETURN            :rem 200
820 PRINT"{CLR}{4 DOWN}{9 RIGHT} CHARLEMA
    GNE'S{SHIFT-SPACE}SWORD":POKEMU+1,15:
    POKEMU+8,30                         :rem 253
830 GOSUB1060:POKEMU+1,22:POKEMU+8,25:GOS
    UB1060:POKEMU+1,8:POKEMU+8,16 :rem 39
840 GOSUB1060                           :rem 227
850 POKEMU+1,15:POKEMU+8,27:GOSUB1060:POK
    EMU+1,15:POKEMU+8,30:GOSUB1070:rem 88
860 FORQ=180TO63STEP-INT(RND(.)*8+2):POKE
    MU+1,Q:NEXT:GOSUB1060               :rem 151
870 T$=" WORD SEARCH "                  :rem 138
880 PRINT"{HOME}{9 DOWN}{18 SPACES}OR":GO
    SUB1090:PRINT:PRINT"{12 SPACES}";
                                        :rem 79
890 FORR=1TOLEN(T$):T2$=MID$(T$,R,1)
                                        :rem 86
900 IFASC(T2$)>64THENPOKE1636+R,ASC(T2$)-
    64:POKE1636+R+54272,1:GOSUB1100:NEXT
                                        :rem 25
910 IFASC(T2$)<65THENPOKE1636+R,ASC(T2$):
    POKE1636+R+54272,1:GOSUB1100:NEXT
                                        :rem 130
920 GOSUB1060                           :rem 226
930 GOSUB1090:PRINT"{CLR}{DOWN}{7 SPACES}
    {RVS} WORD SEARCH INSTRUCTIONS "
                                        :rem 78
940 PRINT"{DOWN}{3 SPACES}MAKE AS MANY WO
    RDS AS POSSIBLE FROM                :rem 252
950 PRINT"{DOWN}{3 SPACES}THE LETTERS SHO
    WN AT THE TOP OF THE                :rem 208
960 PRINT"{DOWN}{3 SPACES}SCREEN. SELECT
    {SPACE}'DICE' (RANDOM               :rem 89
970 PRINT"{DOWN}{3 SPACES}LETTERS) OR 'WO
    RDS' (FROM THE                      :rem 103
980 PRINT"{DOWN}{3 SPACES}COMPUTER'S VOCA
    BULARY).                            :rem 153
```

```
990 PRINT"{DOWN}{3 SPACES}ANY WORD CAN BE
    CHALLENGED BY AN              :rem 208
1000 PRINT"{DOWN}{3 SPACES}OPPONENT AFTER
     THE PLAYER HAS               :rem 240
1010 PRINT"{DOWN}{3 SPACES}COMPLETED HIS
    {SPACE}TURN. SCORING IS BASED
                                  :rem 138
1020 PRINT"{DOWN}{3 SPACES}ON THE NUMBER
    {SPACE}OF LETTERS IN EACH     :rem 42
1030 PRINT"{DOWN}{3 SPACES}WORD. LONGER W
    ORDS SCORE MORE POINTS.       :rem 254
1040 PRINT"{10 SPACES}{RVS}HIT SPACE TO C
    ONTINUE{HOME}                 :rem 242
1050 POKE198,0:WAIT197,33:GETZZ$:RETURN
                                  :rem 161
1060 FORN=1TO500:NEXT:GOSUB1080:RETURN
                                  :rem 184
1070 FORN=1TO1000:NEXT:GOSUB1080:RETURN
                                  :rem 229
1080 POKEMU+1,0:POKEMU+8,0:RETURN :rem 54
1090 FORN=1TO1500:NEXT:RETURN     :rem 105
1100 FORQ=1194TO1212              :rem 111
1110 IFPEEK(Q)=ASC(T2$)-64THENPOKEQ,PEEK(
    Q)+128:POKEMU+1,ASC(T2$)      :rem 140
1120 IFPEEK(Q)=ASC(T2$)THENPOKEQ,PEEK(Q)+
    128:POKEMU+1,ASC(T2$)         :rem 246
1130 NEXT                          :rem 4
1140 FORN=1TO200:NEXT             :rem 23
1150 PRINT"{HOME}{4 DOWN}{9 RIGHT} CHARLE
    MAGNE'S SWORD":RETURN         :rem 46
1160 REM CHECK FOR CORRECT LETTERS:rem 38
1170 IFL$=CHR$(20)THENRETURN      :rem 200
1180 FORXJ=1 TO LD:IF L$=L$(XJ) THEN1200
                                  :rem 191
1190 NEXT:IF L$<>"" THEN PRINT"{LEFT}
    {LEFT}";:L$=""                :rem 161
1200 RETURN                       :rem 163
1210 IF L$="{DOWN}"THEN L$="":RETURN
                                  :rem 143
1220 IF L$="{UP}"THEN L$="":RETURN:rem 16
1230 IF L$="{LEFT}"THEN L$="":RETURN
                                  :rem 29
1240 IF L$="{RIGHT}"THEN L$="":RETURN
                                  :rem 158
1250 RETURN                       :rem 168
1260 DATA A,E,I,O,U,E,L,R,H,Q,T,D :rem 78
1270 DATA W,Y,P,S,F,G,H,J,K,Z,X,C:rem 122
1280 DATA V,B,N,M,L,T,R,N,P,E,S,D:rem 104
1290 DATA A,E,I,O,U,Y             :rem 142
1300 DATA R,T,N,F,A,L,E,I,P,H,D,S :rem 70
1310 DATA ELEPHANT,CONSTRUCTION,VIABILITY
    ,TURNCOAT,VEGETABLE,LIGHTPOST:rem 33
1320 DATA MINERAL,WALNETTO,ROOSEVELT,COMP
    OSITION,DECLARATION,INDEPENDENCE
                                  :rem 209
1330 DATA SPECIFIC,UNDETERMINED,LAUGHABLE
    ,VACILLATE,STALACTITE,FACETIOUSLY
                                  :rem 215
1340 DATA CIVILIZATION,BARBARIANS,CARNIVO
    RE,STRANGLED,COLLECTION,PHILHARMONIC
                                  :rem 223
1350 DATA CONGEALED,LIQUEFIED,TRANSLUCENT
    ,UNSCRUPULOUS,TERPSICHORE,PREHISTORI
    C                             :rem 136
1360 REM 30 WORDS                 :rem 160
```

Program 2: Charlemagne's Sword—VIC Version

```
10 POKE36879,8:PRINT"{WHT}":CV=33792:SQ=4
   519                            :rem 27
20 ER$="{21 SPACES}":MU=36878:POKEMU,15
                                  :rem 100
30 FM$="{HOME}{18 DOWN}"          :rem 224
40 PRINTCHR$(8):GOSUB810:REM TITLES
                                  :rem 193
50 PRINT"{CLR}{3 DOWN}# OF PLAYERS (1-6)"
   ;:FORZ=1TO3:POKEMU-2,230:GOSUB1090:NEX
   T                              :rem 219
60 INPUTNP$:NP=VAL(NP$):IFNP<1ORNP>6THEN5
   0                              :rem 222
70 DIML$(19):{2 SPACES}REM L$ DIM FOR LEN
   GTH OF LONGEST WORD;S$ - NUMBER OF WOR
   DS                             :rem 54
80 DIM DI$(9,6),WO$(80),S$(30) :FORN=1TO9
   :FORR=1TO6:READA$:DI$(N,R)=A$:NEXT:NEX
   T                              :rem 175
90 PL=1:FORN=1TO30:READA$:S$(N)=A$:NEXT:A
   $=""                           :rem 156
100 FORJI=1TO6:HC(JI)=1.41:NEXT:REM HANDI
    CAP SCORE                     :rem 71
110 FORR=1TONP:Q=1                :rem 115
120 FORZ=1TO3:POKEMU-3,230:POKEMU-2,215:G
    OSUB1090:NEXT                 :rem 111
130 PRINT"{DOWN}{3 SPACES}HIT '←' TO QUIT
    ."                            :rem 28
140 PRINT"{2 DOWN}"SPC(7)"{RVS}PLAYER"PL:
    PRINT"{DOWN}{2 SPACES}DO YOU WANT TO
    {SPACE}USE{5 SPACES}{RVS}D{OFF}ICE OR
     {RVS}W{OFF}ORDS?";           :rem 50
150 GET Q$:IF Q$="" THEN150       :rem 111
160 Q$=LEFT$(Q$,1):IFQ$="D"THENL=9:GOSUB6
    50                             :rem 4
170 IF Q$="W" THEN GOSUB770       :rem 193
180 IFQ$<>"W"ANDQ$<>"D"ANDQ$<>"←"THEN150
                                  :rem 38
190 IFQ$="←"THENGOTO490           :rem 131
200 PRINT"{17 DOWN}TIME:[28 E]{HOME}"
                                  :rem 92
210 PRINT"{HOME}{3 DOWN}{5 SPACES}";:FORN
    =1TOL:PRINTL$(N);:NEXT:PRINT  :rem 2
220 POKE161,0:PRINT"{HOME}{6 DOWN}";
                                  :rem 118
230 K=PEEK(161)                   :rem 43
240 POKESQ+K,160:POKESQ+K+CV,1:IF K>23 TH
    EN POKE 36879,10              :rem 249
250 GETL$:GOSUB1230:IFL$=CHR$(13)THENGOSU
    B400:L$="":GOTO300             :rem 7
260 IFL$=CHR$(20)THENIFLEN(A$)>0THENA$=LE
    FT$(A$,LEN(A$)-1):IFLEN(A$)=0THENA$="
    "                             :rem 30
270 POKE 36879,8                  :rem 61
280 IFL$=CHR$(19)THENL$=""        :rem 178
290 PRINTL$;:GOSUB1180:IFL$<>""THENPOKEMU
    -2,210:FORN=1TO10:NEXT:GOSUB1110
                                  :rem 67
295 IF L$=CHR$(20) THEN 310       :rem 83
300 A$=A$+L$                      :rem 53
310 IFK<>27THENGOTO230            :rem 78
320 FORZ=1TO2:POKEMU-2,180:POKEMU-3,145:G
    OSUB1100:NEXT                 :rem 110
330 POKE 198,0:PRINTFM$;ER$;FM$;"CHALLENG
    ES(Y/N)?"                     :rem 228
340 GETC$:IFC$="" THEN340         :rem 85
350 IFC$="N"THENGOSUB450:GOTO380  :rem 179
360 IFC$="Y"THENGOTO550           :rem 107
370 GOTO330                       :rem 105
380 PL=PL+1:IFPL>NPTHENPL=1       :rem 230
390 NEXTR:GOTO110                 :rem 50
400 REM                           :rem 120
410 WO$(Q)=A$:Q=Q+1:A$=""         :rem 56
420 PRINT " ";                    :rem 162
430 FORR=72TO90:POKEMU-2,R:POKEMU-3,R*2:N
```

```
    EXT:GOSUB1110                          :rem 165
440 RETURN                                 :rem 120
450 REM SCORE DISPLAY                      :rem 15
460 FORN=1TOQ:J=LEN(WO$(N)):IF J=0 THEN48
    0                                      :rem 214
470 SC(PL)=SC(PL)+INT(HC(PL)↑J)            :rem 101
480 NEXT:FORN=1TOQ:WO$(N)="":NEXT          :rem 73
490 PRINT"{CLR}{2 DOWN} WORD SEARCH SCORE
    S:{DOWN}"                              :rem 47
500 FORR=1TONP                             :rem 125
510 PRINT"{DOWN}PLAYER"R"{2 SPACES}"SC(R)
                                           :rem 20
520 NEXT:IFQ$="←"THENPRINT"{2 DOWN}THAT'S
     ALL, FOLKS!{BLK}":END                 :rem 7
530 RETURN                                 :rem 120
540 FORN=1TO3000:NEXT:RETURN               :rem 53
550 PRINTFM$;ER$                           :rem 212
560 PRINTFM$;"WHICH WORD";:INPUTCH$
                                           :rem 193
570 ER$=ER$+"{5 SPACES}":PRINT FM$;"
    {DOWN}";ER$;FM$;"{2 DOWN}";ER$:rem 75
580 ER$="{21 SPACES}"                      :rem 217
590 PRINTFM$;:INPUT"CHAL.CORRECT(Y/N)";Y$
    :Y$=LEFT$(Y$,1):IFY$<>"Y"ANDY$<>"N"TH
    EN590                                  :rem 86
600 IFY$="N"THENPRINTFM$+"{DOWN}";ER$:GOT
    O330                                   :rem 99
610 FORQQ=234TO0STEP-2:POKEMU-2,QQ:POKEMU
    -3,QQ:NEXT:GOSUB1110                   :rem 203
620 FORN=1TOQ:IFCH$=WO$(N)THENWO$(N)="":
                                           :rem 160
630 NEXT:PRINTFM$+"{DOWN}";ER$:GOTO330
                                           :rem 213
640 END                                    :rem 113
650 PRINT"{CLR}"SPC(7)"{RVS}PLAYER"PL"
    {OFF}"                                 :rem 2
660 PRINT"YOUR DICE ROLLS:"                :rem 151
670 FORN=1TO9:L$(N)=DI$(N,RND(.)*6+1)
                                           :rem 61
680 NEXT:LD=9                              :rem 29
690 GOSUB700:RETURN                        :rem 208
700 FOR C1=1 TO 9:IF L$(C1)="Q" THEN GOSU
    B720                                   :rem 84
710 NEXT:RETURN                            :rem 241
720 FOR C2=1 TO 9:IF L$(C2)="U" THEN RETU
    RN                                     :rem 35
730 NEXT                                   :rem 217
740 IF C1<3 THEN C3=C1+2:GOTO760           :rem 208
750 C3=C1-2                                :rem 34
760 L$(C3)="U":RETURN                      :rem 196
770 PRINT"{CLR}"SPC(7)"{RVS}PLAYER"PL"
    {OFF}":A=RND(.)*30+1                   :rem 9
780 PRINT"YOUR WORD IS:                    :rem 175
790 FORN=1TOLEN(S$(A)):L$(N)=MID$(S$(A),N
    ,1):NEXT                               :rem 77
800 L=LEN(S$(A)):LD=L:RETURN               :rem 199
810 PRINT"{CLR}{2 DOWN}{RIGHT} CHARLEMAGN
    E'S SWORD":POKEMU-2,178:POKEMU-3,195
                                           :rem 200
820 GOSUB1090:POKEMU-2,224:POKEMU-3,247:G
    OSUB1090:POKEMU-2,168:POKEMU-3,178:GO
    SUB1090                                :rem 186
830 POKEMU-2,239:POKEMU-3,139:GOSUB1090:P
    OKEMU-2,225:POKEMU-3,236:GOSUB1100
                                           :rem 42
840 FORQ=245TO234STEP-INT(RND(.)*8+2):POK
    EMU-2,Q::NEXT:GOSUB1090                :rem 205
850 T$=" WORD SEARCH"                      :rem 136
860 PRINT"{HOME}{9 DOWN}{10 SPACES}OR":GO
    SUB1120:PRINT:PRINT"{12 SPACES}";
                                           :rem 71
870 FORR=1TOLEN(T$):T2$=MID$(T$,R,1)
                                           :rem 84
880 IFASC(T2$)>64THENPOKE4430+R,ASC(T2$)-
    64:POKE4430+R+CV,3:GOSUB1130:NEXT
                                           :rem 176
890 IFASC(T2$)<65THENPOKE4430+R,ASC(T2$):
    POKE4430+R+CV,3:GOSUB1130:NEXT:rem 25
900 GOSUB1090                              :rem 227
910 GOSUB1120:INPUT"{CLR}{2 DOWN}INSTRUCT
    IONS <Y/N>";R$                         :rem 87
920 IF R$="Y" THEN940                      :rem 70
930 RETURN                                 :rem 124
940 PRINT"{CLR}{5 DOWN}{4 RIGHT}{RVS} WOR
    D SEARCH {OFF}":PRINT"{RVS}{4 RIGHT}I
    NSTRUCTIONS:{OFF}":GOSUB1120           :rem 240
950 PRINT"{CLR}":GOSUB1330                 :rem 131
960 PRINT" MAKE AS MANY WORDS":PRINT:PRIN
    T" AS POSSIBLE FROM":PRINT             :rem 168
970 PRINT" THE LETTERS SHOWN":PRINT:PRINT
    " AT THE TOP OF THE                    :rem 147
980 PRINT:PRINT" SCREEN. SELECT 'DICE'":P
    RINT" (RANDOM LETTERS)                 :rem 104
990 PRINT:PRINT" OR 'WORDS' (FROM "
                                           :rem 20
1000 PRINT:PRINT" THE COMPUTER'S":PRINT:P
    RINT" VOCABULARY).                     :rem 34
1010 PRINT:PRINT"{DOWN}{7 SPACES}<MORE>":
    GOSUB1280:GOSUB1330                    :rem 30
1020 PRINT"{CLR}{2 DOWN} ANY WORD CAN BE"
    :PRINT:PRINT" CHALLENGED AFTER"
                                           :rem 209
1030 PRINT:PRINT" THE PLAYER HAS":PRINT:P
    RINT" COMPLETED HIS TURN."             :rem 176
1040 PRINT:PRINT" SCORING IS BASED ON":PR
    INT:PRINT" THE NUMBER OF"              :rem 27
1050 PRINT:PRINT" LETTERS IN EACH":PRINT:
    PRINT" WORD. LONGER WORDS"             :rem 187
1060 PRINT:PRINT " SCORE MORE POINTS."
                                           :rem 25
1070 PRINT"{2 DOWN}{6 SPACES}{RVS}<RETURN
    >{OFF}"                                :rem 185
1080 GOSUB1300:POKEMU-2,0:POKEMU-3,0:POKE
    MU,15:RETURN                           :rem 81
1090 FORN=1TO500:NEXT:GOSUB1110:RETURN
                                           :rem 181
1100 FORN=1TO1000:NEXT:GOSUB1110:RETURN
                                           :rem 217
1110 POKEMU-2,0:POKEMU-3,0:RETURN          :rem 48
1120 FORN=1TO1500:NEXT:RETURN              :rem 99
1130 FORQ=4144TO4156:IFPEEK(Q)=ASC(T2$)-6
    4THENPOKEQ,PEEK(Q)+128:POKEMU-2,ASC(
    T2$)+150                               :rem 65
1140 IFPEEK(Q)=ASC(T2$)THENPOKEQ,PEEK(Q)+
    128:POKEMU-2,ASC(T2$)+150              :rem 188
1150 NEXT                                  :rem 6
1160 FORN=1TO200:NEXT                      :rem 25
1170 PRINT"{HOME}{2 DOWN}{RIGHT} CHARLEMA
    GNE'S SWORD":RETURN                    :rem 38
1180 REM CHECK FOR CORRECT LETTERS:rem 40
1190 IF L$=CHR$(20) THEN RETURN            :rem 202
1200 FORXJ=1 TO LD:IF L$=L$(XJ) THEN1220
                                           :rem 186
1210 NEXT:IF L$<>"" THEN PRINT"{LEFT}
    {LEFT}";:L$=""                         :rem 154
1220 RETURN                                :rem 165
1230 IF L$="{DOWN}"THEN L$="":RETURN
                                           :rem 145
1240 IF L$="{UP}"THEN L$="":RETURN:rem 18
1250 IF L$="{LEFT}"THEN L$="":RETURN
                                           :rem 31
1260 IFL$="{RIGHT}"THEN L$="":RETURN
                                           :rem 160
1270 RETURN                                :rem 170
```

```
1280 GET R$:IF R$="" THEN1280      :rem 219
1290 RETURN                        :rem 172
1300 GET R$:IF R$="" THEN1300      :rem 205
1310 IF R$<> CHR$(13) THEN1300     :rem 237
1320 RETURN                        :rem 166
1330 POKE MU-2,229:FOR DY=15 TO 0 STEP-1:
     POKEMU,DY:FORTY=1 TO 75:NEXT:NEXT:RE
     TURN                          :rem 185
1340 DATA A,E,I,O,U,E,L,R,H,Q,T,D  :rem 77
1350 DATA W,Y,P,S,F,G,H,J,K,Z,X,C:rem 121
1360 DATA V,B,N,M,L,T,R,N,P,E,S,D:rem 103
1370 DATA A,E,I,O,U,Y              :rem 141
1380 DATA R,T,N,F,A,L,E,I,P,H,D,S  :rem 78
1390 DATA ELEPHANT,CONSTRUCTION,VIABILITY
     ,TURNCOAT,VEGETABLE,LIGHTPOST:rem 41
1400 DATA MINERAL,WALNETTO,ROOSEVELT,COMP
     OSITION,DECLARATION,INDEPENDENCE
                                   :rem 208
1410 DATA SPECIFIC,UNDETERMINED,LAUGHABLE
     ,VACILLATE,STALACTITE,FACETIOUSLY
                                   :rem 214
1420 DATA CIVILIZATION,BARBARIANS,CARNIVO
     RE,STRANGLED,COLLECTION,PHILHARMONIC
                                   :rem 222
1430 DATA CONGEALED,LIQUEFIED,TRANSLUCENT
     ,UNSCRUPULOUS,TERPSICHORE,PREHISTORI
     C                             :rem 135
1440 REM 30 WORDS                  :rem 159
```

Power BASIC: Searchlight

(Article on page 114.)

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

Program 1: Searchlight—64 Version

```
10 INPUT"{CLR}STARTING ADDRESS";SA$:SA=VA
   L(SA$)                          :rem 36
20 IFSA<820OR(SA>900ANDSA<2048)OR(SA>3264
   3ANDSA<49152)ORSA>53122THEN10   :rem 151
30 FORI=SATOSA+121:READA:POKEI,A:N=N+A:NE
   XT                              :rem 8
40 IFN<>16667THENPRINT"{CLR}ERROR IN DATA
   ":STOP                          :rem 19
50 A=INT((SA+11)/256):B=SA+11-A*256:C=INT
   ((SA+46)/256):D=SA+46-C*256     :rem 195
60 POKESA+1,B:POKESA+6,A:POKESA+34,D:POKE
   SA+39,C                         :rem 192
70 PRINT"SYS"SA"TO USE":NEW        :rem 195
80 DATA169,11,141,34,3,169,192,141,35,3,9
   6,165                           :rem 16
90 DATA123,201,2,240,26,165,122,133,251,1
   65,57,133                       :rem 191
100 DATA181,165,58,133,182,169,0,133,183,
    169,46,141                     :rem 7
110 DATA6,3,169,192,141,7,3,76,51,243,133
    ,252                           :rem 209
120 DATA165,183,208,18,230,183,169,145,32
    ,210,255,165                   :rem 103
130 DATA181,133,20,165,182,133,21,76,167,
    166,165,183                    :rem 54
140 DATA201,1,208,9,230,183,56,165,251,22
    9,95,133                       :rem 156
150 DATA253,132,254,196,253,240,13,200,20
    0,177,95,240                   :rem 90
160 DATA9,164,254,165,252,76,26,167,198,2
    54,169,95                      :rem 247
170 DATA133,252,169,26,141,6,3,169,167,14
    1,7,3,208,231                  :rem 147
```

Program 2: Searchlight—VIC Version

```
10 INPUT"{CLR}STARTING ADDRESS";SA$:SA=VA
   L(SA$)                          :rem 36
20 FORI=SATOSA+121:READA:POKEI,A:N=N+A:NE
   XT                              :rem 7
30 IFN<>16955THENPRINT"{CLR}ERROR IN DATA
   ":STOP                          :rem 18
40 A=INT((SA+11)/256):B=SA+11-A*256:C=INT
   ((SA+46)/256):D=SA+46-C*256     :rem 194
50 POKESA+1,B:POKESA+6,A:POKESA+34,D:POKE
   SA+39,C                         :rem 191
60 PRINT"SYS"SA"TO USE":NEW        :rem 194
70 DATA169,11,141,34,3,169,192,141,35,3,9
   6,165                           :rem 15
80 DATA123,201,2,240,26,165,122,133,251,1
   65,57,133                       :rem 190
90 DATA181,165,58,133,182,169,0,133,183,1
   69,46,141                       :rem 223
100 DATA6,3,169,192,141,7,3,76,243,243,13
    3,252                          :rem 3
110 DATA165,183,208,18,230,183,169,145,32
    ,210,255,165                   :rem 102
120 DATA181,133,20,165,182,133,21,76,167,
    198,165,183                    :rem 58
130 DATA201,1,208,9,230,183,56,165,251,22
    9,95,133                       :rem 155
140 DATA253,132,254,196,253,240,13,200,20
    0,177,95,240                   :rem 89
150 DATA9,164,254,165,252,76,26,199,198,2
    54,169,95                      :rem 251
160 DATA133,252,169,26,141,6,3,169,199,14
    1,7,3,208,231                  :rem 151
```

MLX

(Article on page 118.)

VIC MLX

```
10 REM LINES CHANGED FROM VIC MLX VERSION
   2.00 ARE 581,582,765            :rem 166
100 PRINT"{CLR}{PUR}";CHR$(142);CHR$(8);
                                   :rem 181
101 POKE 788,194:REM DISABLE RUN/STOP
                                   :rem 174
120 PRINT "{2 DOWN}{7 SPACES}VIC MLX"
                                   :rem 89
200 PRINT"{2 DOWN}{PUR}{BLK}MACHINE LANGU
    AGE":PRINT"EDITOR VER 2.02{5 DOWN}"
                                   :rem 192
210 PRINT"{BLK}{3 UP}STARTING ADDRESS":IN
    PUTS:F=1-F:C$=CHR$(31+119*F)   :rem 97
220 IFS<256ORS>32767THENGOSUB3000:GOTO210
                                   :rem 2
225 PRINT:PRINT:PRINT:PRINT        :rem 123
230 PRINT"{BLK}{3 UP}ENDING ADDRESS":INPU
```

```
    TE:F=1-F:C$=CHR$(31+119*F)    :rem 158
240 IFE<256ORE>32767THENGOSUB3000:GOTO230
                                  :rem 234
250 IFE<STHENPRINTC$;"{RVS}ENDING < START
    {2 SPACES}":GOSUB1000:GOTO 230
                                  :rem 176
260 PRINT:PRINT:PRINT             :rem 179
300 PRINT"{CLR}";CHR$(14):AD=S    :rem 56
310 A=1:PRINTRIGHT$("0000"+MID$(STR$(AD),
    2),5);":";                    :rem 33
315 FOR J=A TO 6                  :rem 33
320 GOSUB570:IFN=-1THENJ=J+N:GOTO320
                                  :rem 228
390 IFN=-211THEN 710              :rem 62
400 IFN=-204THEN 790              :rem 64
410 IFN=-206THENPRINT:INPUT"{DOWN}ENTER N
    EW ADDRESS";ZZ                :rem 44
415 IFN=-206THENIFZZ<SORZZ>ETHENPRINT"
    {RVS}OUT OF RANGE":GOSUB1000:GOTO410
                                  :rem 225
417 IFN=-206THENAD=ZZ:PRINT:GOTO310
                                  :rem 238
420 IF N<>-196 THEN 480           :rem 133
430 PRINT:INPUT"DISPLAY:FROM";F:PRINT,"TO
    ";:INPUTT                     :rem 234
440 IFF<SORF>EORT<SORT>ETHENPRINT"AT LEAS
    T";S;"{LEFT}, NOT MORE THAN";E:GOTO43
    0                             :rem 159
450 FORI=FTOTSTEP6:PRINT:PRINTRIGHT$("000
    0"+MID$(STR$(I),2),5);":";    :rem 30
455 FORK=0TO5:N=PEEK(I+K):IFK=3THENPRINTS
    PC(10);                       :rem 34
457 PRINTRIGHT$("00"+MID$(STR$(N),2),3);"
    ,";                           :rem 157
460 GETA$:IFA$>""THENPRINT:PRINT:GOTO310
                                  :rem 25
470 NEXTK:PRINTCHR$(20);:NEXTI:PRINT:PRIN
    T:GOTO310                     :rem 50
480 IFN<0 THEN PRINT:GOTO310      :rem 168
490 A(J)=N:NEXTJ                  :rem 199
500 CKSUM=AD-INT(AD/256)*256:FORI=1TO6:CK
    SUM=(CKSUM+A(I))AND255:NEXT   :rem 200
510 PRINTCHR$(18);:GOSUB570:PRINTCHR$(146
    );                            :rem 94
511 IFN=-1THENA=6:GOTO315         :rem 254
515 PRINTCHR$(20):IFN=CKSUMTHEN530
                                  :rem 122
520 PRINT:PRINT"LINE ENTERED WRONG":PRINT
    "RE-ENTER":PRINT:GOSUB1000:GOTO310
                                  :rem 129
530 GOSUB2000                     :rem 218
540 FORI=1TO6:POKEAD+I-1,A(I):NEXT:rem 80
550 AD=AD+6:IF AD<E THEN 310      :rem 212
560 GOTO 710                      :rem 108
570 N=0:Z=0                       :rem 88
580 PRINT"[+]";                   :rem 79
581 GETA$:IFA$=""THEN581          :rem 95
582 AV=-(A$="M")-2*(A$=",")-3*(A$=".")-4*
    (A$="J")-5*(A$="K")-6*(A$="L"):rem 41
583 AV=AV-7*(A$="U")-8*(A$="I")-9*(A$="O"
    ):IFA$="H"THENA$="0"          :rem 134
584 IFAV>0THENA$=CHR$(48+AV)      :rem 134
585 PRINTCHR$(20);:A=ASC(A$):IFA=13ORA=44
    ORA=32THEN670                 :rem 229
590 IFA>128THENN=-A:RETURN        :rem 137
600 IFA<>20 THEN 630              :rem 10
610 PRINTCHR$(146);:GOSUB690:IFI=1ANDT=44
    THENN=-1:PRINT"{LEFT} {LEFT}";:GOTO69
    0                             :rem 155
620 GOTO570                       :rem 109
630 IFA<48ORA>57THEN580           :rem 105
640 PRINTA$;:N=N*10+A-48          :rem 106
650 IFN>255 THEN A=20:GOSUB1000:GOTO600
                                  :rem 229
660 Z=Z+1:IFZ<3THEN580            :rem 71
670 IFZ=0THENGOSUB1000:GOTO570    :rem 114
680 PRINT",";:RETURN              :rem 240
690 S%=PEEK(209)+256*PEEK(210)+PEEK(211)
                                  :rem 149
692 FORI=1TO3:T=PEEK(S%-I)        :rem 68
695 IFT<>44ANDT<>58THENPOKES%-I,32:NEXT
                                  :rem 205
700 PRINTLEFT$("{3 LEFT}",I-1);:RETURN
                                  :rem 7
710 PRINT"{CLR}{RVS}*** SAVE ***{3 DOWN}"
                                  :rem 236
720 F$="":INPUT"{DOWN} FILENAME";F$:IFF$=
    ""THEN310                     :rem 128
730 PRINT:PRINT"{2 DOWN}{RVS}T{OFF}APE OR
    {RVS}D{OFF}ISK: (T/D)"        :rem 228
740 GETA$:IFA$<>"T"ANDA$<>"D"THEN740
                                  :rem 36
750 DV=1-7*(A$="D"):IFDV=8THENF$="0:"+F$:
    OPEN15,8,15,"S"+F$:CLOSE15    :rem 212
760 T$=F$:ZK=PEEK(53)+256*PEEK(54)-LEN(T$
    ):POKE782,ZK/256              :rem 3
762 POKE781,ZK-PEEK(782)*256:POKE780,LEN(
    T$):SYS65469                  :rem 109
763 POKE780,1:POKE781,DV:POKE782,1:SYS654
    66                            :rem 69
765 K=S:POKE254,K/256:POKE253,K-PEEK(254)
    *256:POKE780,253              :rem 17
766 K=E+1:POKE782,K/256:POKE781,K-PEEK(78
    2)*256:SYS65496               :rem 235
770 IF(PEEK(783)AND1)OR(191ANDST)THEN780
                                  :rem 111
775 PRINT"{DOWN}DONE.":GOTO310    :rem 96
780 PRINT"{DOWN}ERROR ON SAVE.{2 SPACES}T
    RY AGAIN.":IFDV=1THEN720      :rem 171
781 OPEN15,8,15:INPUT#15,E1$,E2$:PRINTE1$
    ;E2$:CLOSE15:GOTO720          :rem 103
782 GOTO720                       :rem 115
790 PRINT"{CLR}{RVS}*** LOAD ***{2 DOWN}"
                                  :rem 212
800 F$="":INPUT"{2 DOWN} FILENAME";F$:IFF
    $=""THEN310                   :rem 144
810 PRINT:PRINT"{2 DOWN}{RVS}T{OFF}APE OR
    {RVS}D{OFF}ISK: (T/D)"        :rem 227
820 GETA$:IFA$<>"T"ANDA$<>"D"THEN820
                                  :rem 34
830 DV=1-7*(A$="D"):IFDV=8THENF$="0:"+F$
                                  :rem 157
840 T$=F$:ZK=PEEK(53)+256*PEEK(54)-LEN(T$
    ):POKE782,ZK/256              :rem 2
841 POKE781,ZK-PEEK(782)*256:POKE780,LEN(
    T$):SYS65469                  :rem 107
845 POKE780,1:POKE781,DV:POKE782,1:SYS654
    66                            :rem 70
850 POKE780,0:SYS65493            :rem 11
860 IF(PEEK(783)AND1)OR(191ANDST)THEN870
                                  :rem 111
865 PRINT"{DOWN}DONE.":GOTO310    :rem 96
870 PRINT"{DOWN}ERROR ON LOAD.{2 SPACES}T
    RY AGAIN.{DOWN}":IFDV=1THEN800
                                  :rem 172
880 OPEN15,8,15:INPUT#15,E1$,E2$:PRINTE1$
    ;E2$:CLOSE15:GOTO800          :rem 102
1000 REM BUZZER                   :rem 135
1001 POKE36878,15:POKE36874,190   :rem 206
1002 FORW=1TO300:NEXTW            :rem 117
```

```
1003 POKE36878,0:POKE36874,0:RETURN
                                    :rem 74
2000 REM BELL SOUND                 :rem 78
2001 FORW=15TO0STEP-1:POKE36878,W:POKE368
     76,240:NEXTW                   :rem 22
2002 POKE36876,0:RETURN             :rem 119
3000 PRINTC$;"{RVS}NOT ZERO PAGE OR ROM":
     GOTO1000                       :rem 89
```

64 MLX

```
10 REM LINES CHANGED FROM MLX VERSION 2.0
   0 ARE 750,765,770 AND 860        :rem 50
20 REM LINE CHANGED FROM MLX VERSION 2.01
    IS 300                          :rem 147
100 PRINT"{CLR}{6}";CHR$(142);CHR$(8);:PO
    KE53281,1:POKE53280,1           :rem 67
101 POKE 788,52:REM DISABLE RUN/STOP
                                    :rem 119
110 PRINT"{RVS}{39 SPACES}";        :rem 176
120 PRINT"{RVS}{14 SPACES}{RIGHT}{OFF}{*}
    £{RVS}{RIGHT} {RIGHT}{2 SPACES}{*}
    {OFF}{*}£{RVS}£{RVS}{14 SPACES}";
                                    :rem 250
130 PRINT"{RVS}{14 SPACES}{RIGHT} {G}
    {RIGHT} {2 RIGHT} {OFF}£{RVS}£{*}
    {OFF}{*}{RVS}{14 SPACES}";      :rem 35
140 PRINT"{RVS}{41 SPACES}"         :rem 120
200 PRINT"{2 DOWN}{PUR}{BLK} MACHINE LANG
    UAGE EDITOR VERSION 2.02{5 DOWN}"
                                    :rem 238
210 PRINT"{5}{2 UP}STARTING ADDRESS?
    {8 SPACES}{9 LEFT}";            :rem 143
215 INPUTS:F=1-F:C$=CHR$(31+119*F)
                                    :rem 166
220 IFS<256OR(S>40960ANDS<49152)ORS>53247
    THENGOSUB3000:GOTO210           :rem 235
225 PRINT:PRINT:PRINT               :rem 180
230 PRINT"{5}{2 UP}ENDING ADDRESS?
    {8 SPACES}{9 LEFT}";:INPUTE:F=1-F:C$=
    CHR$(31+119*F)                  :rem 20
240 IFE<256OR(E>40960ANDE<49152)ORE>53247
    THENGOSUB3000:GOTO230           :rem 183
250 IFE<STHENPRINTC$;"{RVS}ENDING < START
    {2 SPACES}":GOSUB1000:GOTO 230
                                    :rem 176
260 PRINT:PRINT:PRINT               :rem 179
300 PRINT"{CLR}";CHR$(14):AD=S      :rem 56
310 A=1:PRINTRIGHT$("0000"+MID$(STR$(AD),
    2),5);":";                      :rem 33
315 FORJ=ATO6                       :rem 33
320 GOSUB570:IFN=-1THENJ=J+N:GOTO320
                                    :rem 228
390 IFN=-211THEN 710                :rem 62
400 IFN=-204THEN 790                :rem 64
410 IFN=-206THENPRINT:INPUT"{DOWN}ENTER N
    EW ADDRESS";ZZ                  :rem 44
415 IFN=-206THENIFZZ<SORZZ>ETHENPRINT"
    {RVS}OUT OF RANGE":GOSUB1000:GOTO410
                                    :rem 225
417 IFN=-206THENAD=ZZ:PRINT:GOTO310
                                    :rem 238
420 IF N<>-196 THEN 480             :rem 133
430 PRINT:INPUT"DISPLAY:FROM";F:PRINT,"TO
    ";:INPUTT                       :rem 234
440 IFF<SORF>EORT<SORT>ETHENPRINT"AT LEAS
    T";S;"{LEFT}, NOT MORE THAN";E:GOTO43
    0                               :rem 159
450 FORI=FTOTSTEP6:PRINT:PRINTRIGHT$("000
    0"+MID$(STR$(I),2),5);":";      :rem 30
451 FORK=0TO5:N=PEEK(I+K):PRINTRIGHT$("00
    "+MID$(STR$(N),2),3);",";       :rem 66
460 GETA$:IFA$>""THENPRINT:PRINT:GOTO310
                                    :rem 25
470 NEXTK:PRINTCHR$(20);:NEXTI:PRINT:PRIN
    T:GOTO310                       :rem 50
480 IFN<0 THEN PRINT:GOTO310        :rem 168
490 A(J)=N:NEXTJ                    :rem 199
500 CKSUM=AD-INT(AD/256)*256:FORI=1TO6:CK
    SUM=(CKSUM+A(I))AND255:NEXT     :rem 200
510 PRINTCHR$(18);:GOSUB570:PRINTCHR$(146
    );                              :rem 94
511 IFN=-1THENA=6:GOTO315           :rem 254
515 PRINTCHR$(20):IFN=CKSUMTHEN530
                                    :rem 122
520 PRINT:PRINT"LINE ENTERED WRONG : RE-E
    NTER":PRINT:GOSUB1000:GOTO310:rem 176
530 GOSUB2000                       :rem 218
540 FORI=1TO6:POKEAD+I-1,A(I):NEXT:POKE54
    272,0:POKE54273,0               :rem 227
550 AD=AD+6:IF AD<E THEN 310        :rem 212
560 GOTO 710                        :rem 108
570 N=0:Z=0                         :rem 88
580 PRINT"{£}";                     :rem 81
581 GETA$:IFA$=""THEN581            :rem 95
582 AV=-(A$="M")-2*(A$=",")-3*(A$=".")-4*
    (A$="J")-5*(A$="K")-6*(A$="L"):rem 41
583 AV=AV-7*(A$="U")-8*(A$="I")-9*(A$="O"
    ):IFA$="H"THENA$="0"            :rem 134
584 IFAV>0THENA$=CHR$(48+AV)        :rem 134
585 PRINTCHR$(20);:A=ASC(A$):IFA=13ORA=44
    ORA=32THEN670                   :rem 229
590 IFA>128THENN=-A:RETURN          :rem 137
600 IFA<>20 THEN 630                :rem 10
610 GOSUB690:IFI=1ANDT=44THENN=-1:PRINT"
    {OFF}{LEFT} {LEFT}";:GOTO690    :rem 62
620 GOTO570                         :rem 109
630 IFA<48ORA>57THEN580             :rem 105
640 PRINTA$;:N=N*10+A-48            :rem 106
650 IFN>255 THEN A=20:GOSUB1000:GOTO600
                                    :rem 229
660 Z=Z+1:IFZ<3THEN580              :rem 71
670 IFZ=0THENGOSUB1000:GOTO570      :rem 114
680 PRINT",";:RETURN                :rem 240
690 S%=PEEK(209)+256*PEEK(210)+PEEK(211)
                                    :rem 149
691 FORI=1TO3:T=PEEK(S%-I)          :rem 67
695 IFT<>44ANDT<>58THENPOKES%-I,32:NEXT
                                    :rem 205
700 PRINTLEFT$("{3 LEFT}",I-1);:RETURN
                                    :rem 7
710 PRINT"{CLR}{RVS}*** SAVE ***{3 DOWN}"
                                    :rem 236
715 PRINT"{2 DOWN}(PRESS {RVS}RETURN{OFF}
     ALONE TO CANCEL SAVE){DOWN}":rem 106
720 F$="":INPUT"{DOWN} FILENAME";F$:IFF$=
    ""THENPRINT:PRINT:GOTO310       :rem 71
730 PRINT:PRINT"{2 DOWN}{RVS}T{OFF}APE OR
     {RVS}D{OFF}ISK: (T/D)"         :rem 228
740 GETA$:IFA$<>"T"ANDA$<>"D"THEN740
                                    :rem 36
750 DV=1-7*(A$="D"):IFDV=8THENF$="0:"+F$:
    OPEN15,8,15,"S"+F$:CLOSE15      :rem 212
760 T$=F$:ZK=PEEK(53)+256*PEEK(54)-LEN(T$
    ):POKE782,ZK/256                :rem 3
762 POKE781,ZK-PEEK(782)*256:POKE780,LEN(
    T$):SYS65469                    :rem 109
763 POKE780,1:POKE781,DV:POKE782,1:SYS654
    66                              :rem 69
765 K=S:POKE254,K/256:POKE253,K-PEEK(254)
    *256:POKE780,253                :rem 17
766 K=E+1:POKE782,K/256:POKE781,K-PEEK(78
```

```
    2)*256:SYS65496                    :rem 235
770 IF(PEEK(783)AND1)OR(191ANDST)THEN780
                                       :rem 111
775 PRINT"{DOWN}DONE.{DOWN}":GOTO310
                                       :rem 113
780 PRINT"{DOWN}ERROR ON SAVE.{2 SPACES}T
    RY AGAIN.":IFDV=1THEN720           :rem 171
781 OPEN15,8,15:INPUT#15,E1$,E2$:PRINTE1$
    ;E2$:CLOSE15:GOTO720               :rem 103
790 PRINT"{CLR}{RVS}*** LOAD ***{2 DOWN}"
                                       :rem 212
795 PRINT"{2 DOWN}(PRESS {RVS}RETURN{OFF}
     ALONE TO CANCEL LOAD)"            :rem 82
800 F$="":INPUT"{2 DOWN} FILENAME";F$:IFF
    $=""THENPRINT:GOTO310              :rem 144
810 PRINT:PRINT"{2 DOWN}{RVS}T{OFF}APE OR
     {RVS}D{OFF}ISK: (T/D)"            :rem 227
820 GETA$:IFA$<>"T"ANDA$<>"D"THEN820
                                       :rem 34
830 DV=1-7*(A$="D"):IFDV=8THENF$="0:"+F$
                                       :rem 157
840 T$=F$:ZK=PEEK(53)+256*PEEK(54)-LEN(T$
    ):POKE782,ZK/256                   :rem 2
841 POKE781,ZK-PEEK(782)*256:POKE780,LEN(
    T$):SYS65469                       :rem 107
845 POKE780,1:POKE781,DV:POKE782,1:SYS654
    66                                 :rem 70
850 POKE780,0:SYS65493                 :rem 11
860 IF(PEEK(783)AND1)OR(191ANDST)THEN870
                                       :rem 111
865 PRINT"{DOWN}DONE.":GOTO310         :rem 96
870 PRINT"{DOWN}ERROR ON LOAD.{2 SPACES}T
    RY AGAIN.{DOWN}":IFDV=1THEN800
                                       :rem 172
880 OPEN15,8,15:INPUT#15,E1$,E2$:PRINTE1$
    ;E2$:CLOSE15:GOTO800               :rem 102
1000 REM BUZZER                        :rem 135
1001 POKE54296,15:POKE54277,45:POKE54278,
     165                               :rem 207
1002 POKE54276,33:POKE 54273,6:POKE54272,
     5                                 :rem 42
1003 FORT=1TO200:NEXT:POKE54276,32:POKE54
     273,0:POKE54272,0:RETURN          :rem 202
2000 REM BELL SOUND                    :rem 78
2001 POKE54296,15:POKE54277,0:POKE54278,2
     47                                :rem 152
2002 POKE 54276,17:POKE54273,40:POKE54272
     ,0                                :rem 86
2003 FORT=1TO100:NEXT:POKE54276,16:RETURN
                                       :rem 57
3000 PRINTC$;"{RVS}NOT ZERO PAGE OR ROM":
     GOTO1000                          :rem 89
```

Jogger's Log

(Article on page 56.)

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

Program 1: Jogger's Log—VIC Version

```
10 CL$=CHR$(147):R$=CHR$(18):RF$=CHR$(146
   ):D1$=CHR$(17):U1$=CHR$(145):Q$=","
                                       :rem 58
15 CR$=CHR$(13)                        :rem 18
20 U3$=U1$+U1$+U1$:D2$=D1$+D1$:OM$="(EQ,N
   E,GT,LT,GE,LE)":M$="CAMDSX"         :rem 34
30 PRINTCL$TAB(5)D2$R$"JOGGER'S LOG"RF$D1
   $:INPUT"MAX # OF RUNS ";RM          :rem 145
40 DIMDM%(12),C$(5,2),TB%(2,RM),N%(5),OP$
   (5),VL$(5),D$(5)                    :rem 128
50 FORI=1TO12:READDM%(I):NEXT          :rem 40
60 FORJ=1TO2:FORI=1TO5:READC$(I,J):NEXTI:
   NEXTJ                               :rem 220
70 GOSUB120:ONMGOTO690,750,790,850,910,20
   0:GOTO70                            :rem 49
80 PRINT"CAN'T DO PAST";R:FORI=1TO2500:NE
   XT:GOTO70                           :rem 115
90 INPUT#15,A,B$,C,D:IFA=0THENRETURN
                                       :rem 230
100 PRINTD2$"ERROR ON DISK":PRINTA;B$;C;D
    :GOTO200                           :rem 249
110 REM MAIN MENU                      :rem 208
120 B$="":PRINT"{CLR}{3 DOWN} {RVS}C{OFF}
     CREATE A FILE":PRINT"{DOWN} {RVS}A
    {OFF} ADD A RECORD"                :rem 17
130 PRINT"{DOWN} {RVS}M{OFF} MODIFY A REC
    ORD":PRINT"{DOWN} {RVS}D{OFF} DELETE
    {SPACE}A RECORD"                   :rem 230
140 PRINT"{DOWN} {RVS}S{OFF} SHOW A RECOR
    D":PRINT"{DOWN} {RVS}X{OFF} EXIT"
                                       :rem 1
150 INPUT"{DOWN} ";B$:FORM=1TO6:IFB$<>MID
    $(M$,M,1)THENNEXT                  :rem 126
160 RETURN                             :rem 119
170 REM MISC SUBROUTINES               :rem 11
180 B$="Y":PRINTTAB(14)B$U1$:INPUT"ANOTHE
    R(Y/N)";B$:PRINTCL$:RETURN         :rem 184
190 INPUT"{DOWN}NAME ";F$:INPUT"RUN# ";P:
    CLOSE15:OPEN15,8,15:GOSUB270:RETURN
                                       :rem 65
200 CLOSE1:CLOSE2:CLOSE15:END          :rem 66
210 INPUT"{DOWN}NAME ";F$:CLOSE15:CLOSE2:
    OPEN15,8,15:OPEN2,8,2,"#":GOSUB270:RE
    TURN                               :rem 94
220 FORZ=1TO5:PRINT"#";Z;R$C$(Z,1)RF$" "D
    $(Z)D1$:NEXTZ:RETURN               :rem 151
230 PRINTD1$R$"CR"RF$" TO CONTINUE":INPUT
    B$:PRINTCL$:RETURN                 :rem 214
240 PRINTD2$R$C$(Z,1)RF$,C$(Z,2):INPUTD$(
    Z):RETURN                          :rem 241
250 REM DISK SUBROUTINES                :rem 9
260 REM GET INDEX FILE                 :rem 244
270 OPEN1,8,0,"0:"+F$+".INDX,S,R":GOSUB90
                                       :rem 27
280 FORN=1TO600:INPUT#1,TB%(1,N),TB%(2,N)
    :IFST>64THENR=N-1:CLOSE1:RETURN
                                       :rem 216
290 IFN>RMTHENPRINT"INCREASE MAX RUN#":GO
    TO200                              :rem 162
300 NEXTN                              :rem 32
310 REM SAVE INDEX FILE                :rem 63
320 OPEN1,8,1,"@0:"+F$+".INDX,S,W":GOSUB9
    0                                  :rem 93
330 FORN=1TOR:PRINT#1,TB%(1,N)CR$TB%(2,N)
    :GOSUB90:NEXTN:CLOSE1:CLOSE15:RETURN
                                       :rem 152
340 REM FIND NEXT FREE TRACK & BLOCK
                                        :rem 3
350 T=1:B=1                            :rem 68
360 PRINT#15,"B-A:"0;T;B:INPUT#15,A,B$,C,
    D:IFA=65THENT=C:B=D:GOTO360        :rem 52
370 TB%(1,P)=T:TB%(2,P)=B              :rem 87
380 REM WRITE RUN# P                  :rem 114
```

```
390 PRINT#2,D$(1)Q$D$(2)Q$D$(3)Q$D$(4)Q$D
    $(5)                              :rem 26
395 PRINT#15,"B-W:"2;0;TB%(1,P);TB%(2,P):
    RETURN                           :rem 199
400 REM{4 SPACES}READ RUN# P         :rem 252
410 T=TB%(1,P):B=TB%(2,P):PRINT#15,"B-R:"
    2;0;T;B                          :rem 182
420 INPUT#2,D$(1),D$(2),D$(3),D$(4),D$(5)
    :RETURN                          :rem 13
430 REM END DISK SUBROUTINES         :rem 224
440 REM SELECTION                    :rem 34
450 PRINTCL$D1$R$"SELECTION CRITERIA"RF$:
    PRINTD2$"ENTER #,OPTION,VALUE"D2$
                                     :rem 111
460 FORX=1TO5                        :rem 31
470 FORZ=1TO5:PRINT"#";Z;"IS FOR ";C$(Z,1
    ):NEXTZ                          :rem 100
480 PRINTTAB(5)D2$"OPTIONS =":PRINTOM$D1$
    :N%(X)=0:INPUTN%(X),OP$(X),VL$(X):PRI
    NTCL$                            :rem 67
490 IFN%(X)=0THENX=X-1:RETURN        :rem 73
500 NEXTX:RETURN                     :rem 70
510 REM CALC PACE                    :rem 166
520 MI=VAL(MID$(TM$,1,2))*60+VAL(MID$(TM$
    ,3,2))                           :rem 45
530 MI=MI+VAL(MID$(TM$,5,2))/60:PRINTDS$"
    MI";                             :rem 95
540 PA=MI/VAL(DS$):PM=INT(PA):PS=INT((PA-
    PM)*60):TM$=STR$(PM):A=LEN(TM$):B$=ST
    R$(PS)                           :rem 112
550 D=LEN(B$):DS$="":IFD=2THENDS$="0"
                                     :rem 62
560 PRINT"..."MID$(TM$,2,A-1)":"DS$MID$(B
    $,2,D-1)" PACE":RETURN           :rem 196
570 REM CALC DAY#                    :rem 148
580 U=VAL(LEFT$(DY$,2)):IFU<1ORU>12THENPR
    INTT"BAD MONTH";DY$:GOTO200      :rem 230
590 DA=DM%(U)+VAL(RIGHT$(DY$,2))*365+VAL(
    MID$(DY$,3,2)):RETURN            :rem 59
600 REM KEEP HIM HONEST              :rem 78
610 FORZ=1TO3STEP2:IFLEN(D$(Z))<>6THENPRI
    NTD$(Z):GOTO200                  :rem 26
620 NEXTZ:RETURN                     :rem 75
630 REM DATA BASE SUBROUTINES        :rem 21
640 REM DATA ENTRY                   :rem 42
650 PRINTCL$"ENTER DATA ON RUN#";P
                                     :rem 247
660 FORZ=1TO5:D$(Z)="":GOSUB240:NEXTZ
                                     :rem 20
670 GOSUB610:GOSUB350:RETURN         :rem 32
680 REM CREATE A FILE                :rem 151
690 INPUT"{DOWN} NAME ";F$:OPEN15,8,2,F$+
    ".INDX,S,R":OPEN11,8,15:INPUT#11,A$,B
    $,C$                             :rem 10
700 IFB$<>"FILE NOT FOUND"THENPRINTF$" AL
    READY EXISTS":CLOSE11:CLOSE15:GOTO690
                                     :rem 93
710 CLOSE11:CLOSE15:OPEN15,8,15:OPEN2,8,2
    ,"#"                             :rem 65
720 FORP=1TORM:GOSUB650:GOSUB180:IFB$="Y"
    THENNEXTP                        :rem 239
730 R=P:GOSUB320:CLOSE2:GOTO70       :rem 132
740 REM ADD AN ENTRY                 :rem 105
750 GOSUB210:IFR+1>RMTHEN80          :rem 154
760 R=R+1:P=R:GOSUB650               :rem 72
770 GOSUB320:CLOSE2:GOTO70           :rem 111
780 REM MODIFY RUN# P                :rem 179
790 GOSUB190:CLOSE2:OPEN2,8,2,"#":IFP>RTH
    EN80                             :rem 207
800 GOSUB410:PRINT"{CLR}":GOSUB220
                                     :rem 153
810 Z=0:INPUT"MODIFY #";Z:IFZ=0THENGOSUB6
    10:GOSUB390:CLOSE2:CLOSE15:GOTO70
                                     :rem 236
820 IFZ>=6THENPRINT"BAD #":GOTO810:rem 42
830 GOSUB240:GOTO810                 :rem 189
840 REM DELETE AN ENTRY              :rem 84
850 GOSUB190:IFP>RTHEN80             :rem 247
860 PRINT#15,"B-F:"0;TB%(1,P);TB%(2,P)
                                     :rem 44
870 IF P<RTHEN FORZ=P+1TOR:TB%(1,Z-1)=TB%
    (1,Z):TB%(2,Z-1)=TB%(2,Z):NEXTZ
                                     :rem 229
880 R=R-1:GOSUB320:CLOSE2:GOTO70     :rem 234
890 REM ANALYSIS SUBROUTINES         :rem 76
900 REM SHOW RESULTS                 :rem 240
910 GOSUB210:GOSUB450                :rem 0
920 WM=0:WT=0:BG=0:PRINTD2$"ENTER 1-LIST"
    ,TAB(6)"2-PACE",TAB(6)"3-PLOT"
                                     :rem 158
930 INPUTTX:PRINTCL$:IFTX<>3THEN950
                                     :rem 65
940 PRINTCL$"ONE *=HOW MANY MILES":INPUTS
    C:SC=1/SC                        :rem 106
950 FORP=1TOR:GOSUB410:C=0:IFX=0THEN1060
                                     :rem 245
960 REM LOGICAL SELECTION            :rem 36
970 FORW=1TOX:N=N%(W)                :rem 39
980 IFOP$(W)="EQ"THENIFD$(N)=VL$(W)THENC=
    C+1:GOTO1040                     :rem 168
990 IFOP$(W)="NE"THENIFD$(N)<>VL$(W)THENC
    =C+1:GOTO1040                    :rem 227
1000 IFOP$(W)="LT"THENIFD$(N)<VL$(W)THENC
    =C+1:GOTO1040                    :rem 209
1010 IFOP$(W)="GT"THENIFD$(N)>VL$(W)THENC
    =C+1:GOTO1040                    :rem 207
1020 IFOP$(W)="LE"THENIFD$(N)<=VL$(W)THEN
    C=C+1:GOTO1040                   :rem 1
1030 IFOP$(W)="GE"THENIFD$(N)>=VL$(W)THEN
    C=C+1:GOTO1040                   :rem 255
1040 NEXTW                           :rem 91
1050 IFC<>XTHEN1250                  :rem 97
1060 ONTXGOTO1080,1110,1170          :rem 246
1070 REM LIST                        :rem 232
1080 PRINT"{10 SPACES}"R$"RUN#"RF$;P;D1$:
    GOSUB220:PRINTD2$D1$:GOSUB230:rem 30
1090 GOTO1250                        :rem 203
1100 REM PACE                        :rem 191
1110 DY$=D$(1):GOSUB580:IFBG=0THENBG=DA
                                     :rem 59
1120 TM$=D$(3):DS$=D$(2):GOSUB520:WM=WM+M
    I/PA:WT=WT+MI                    :rem 238
1130 IFDA>=BG+6THENBG=BG+7:DS$=STR$(WM):M
    I=WT:PRINTR$DS$"MI/WK"RF$;:GOSUB540:
    WM=0:WT=0                        :rem 164
1140 IFWT=0THENGOSUB230              :rem 177
1150 GOTO1250                        :rem 200
1160 REM GRAPH                       :rem 30
1170 DY$=D$(1):GOSUB580:IFBG=0THENBG=DA:E
    =0                               :rem 45
1180 N0=DA-BG:BG=DA:IFN0<2THEN1200
                                     :rem 236
1190 FORZ=2TON0:PRINT"0":E=E+1:NEXT
                                     :rem 173
1200 NS=INT(VAL(D$(2))*SC+.5):B$="*":IFNS
    =1THEN1230                       :rem 98
1210 IFNS>23THENNS=23                :rem 9
1220 FORZ=2TONS:B$=B$+"*":NEXTZ      :rem 104
1230 PRINTB$:E=E+1:IFE>15THENE=0:GOSUB230
                                     :rem 248
```

```
1240 IFE=0THENFORZ=1TO16:PRINT" ";:NEXT:P
     RINT"{2 UP}"                    :rem 220
1250 NEXTP                           :rem 87
1260 CLOSE1:CLOSE2:CLOSE15           :rem 104
1270 IFTX<>1THENGOSUB230             :rem 244
1280 GOTO 70                         :rem 107
1290 DATA0,31,59,90,120,151,181,212,243,2
     73,304,334                      :rem 244
1300 DATADATE,DISTANCE,TIME,ROUTE,COMMENT
     S,(MMDDYY),(MILES),(HHMMSS)     :rem 176
1310 DATA(< 88 CHRS),(< 88 CHRS)     :rem 101
```

Program 2: Jogger's Log—64 Version

```
10 CL$=CHR$(147):R$=CHR$(18):RF$=CHR$(146
   ):D1$=CHR$(17):U1$=CHR$(145):Q$=","
                                     :rem 58
20 CR$=CHR$(13):U3$=U1$+U1$+U1$:D2$=D1$+D
   1$:OM$="(EQ,NE,GT,LT,GE,LE)"      :rem 28
30 POKE53280,6:POKE53281,1           :rem 191
40 M$="CAMDSX":PRINTCL$TAB(13)D2$R$"
   {3 DOWN}JOGGER'S LOG"RF$D1$       :rem 18
50 INPUT"{4 DOWN}{3 SPACES}MAX # OF RUNS?
   {LEFT}";RM                        :rem 25
60 DIMDM%(12),C$(5,2),TB%(2,RM),N%(5),OP$
   (5),VL$(5),D$(5)                  :rem 130
70 FORI=1TO12:READDM%(I):NEXT        :rem 42
80 FORJ=1TO2:FORI=1TO5:READC$(I,J):NEXTI:
   NEXTJ                             :rem 222
90 GOSUB140:ONMGOTO700,760,800,860,920,22
   0:GOTO90                          :rem 44
100 PRINT"{2 DOWN}{2 SPACES}CAN'T DO PAST
    ";R:FORI=1TO2000:NEXT:GOTO90     :rem 187
110 INPUT#15,A,B$,C,D:IFA=0THENRETURN
                                     :rem 15
120 PRINTD2$"{CLR}{12 DOWN} ERROR ON DISK
    ":PRINT A;B$;C;D:GOTO221         :rem 93
130 REM MAIN MENU                    :rem 210
140 B$="":PRINT"{CLR}{4 DOWN} {RVS}C{OFF}
     CREATE A FILE":PRINT"{DOWN} {RVS}A
    {OFF} ADD A FILE"                :rem 133
150 PRINT"{DOWN} {RVS}M{OFF} MODIFY A REC
    ORD":PRINT"{DOWN} {RVS}D{OFF} DELETE
    {SPACE}A RECORD"                 :rem 232
160 PRINT"{DOWN} {RVS}S{OFF} SHOW A RECOR
    D":PRINT"{DOWN} {RVS}X{OFF} EXIT
    {DOWN}"                          :rem 20
170 INPUT" ";B$:FORM=1TO6:IFB$<>MID$(M$,M
    ,1)THENNEXT                      :rem 111
180 RETURN                           :rem 121
190 REM MISC SUBROUTINES             :rem 13
200 B$="Y":PRINTD1$TAB(5):INPUT"ANOTHER(Y
    /N)";B$:PRINTCL$:RETURN          :rem 10
210 INPUT"{2 DOWN}{2 SPACES}NAME";F$:INPU
    T"{DOWN}{2 SPACES}RUN # ";P:CLOSE15:O
    PEN15,8,15:GOSUB290:RETURN       :rem 94
220 CLOSE1:CLOSE2:CLOSE15:POKE198,0:SYS19
    8                                :rem 117
221 CLOSE1:CLOSE2:CLOSE15:END        :rem 69
230 INPUT"{2 DOWN}{2 SPACES}NAME";F$:CLOS
    E15:CLOSE2:OPEN15,8,15:OPEN2,8,2,"#":
    GOSUB290:RETURN                  :rem 115
240 FORZ=1TO5:PRINT"#";Z;R$C$(Z,1)RF$"="D
    $(Z)D1$:NEXTZ:RETURN             :rem 214
250 PRINTD1$"{2 SPACES}"R$"CR"RF$" TO CON
    TINUE":INPUT"{2 SPACES}";B$:PRINTCL$:
    RETURN                           :rem 155
260 PRINTD2$TAB(10)R$C$(Z,1)RF$,C$(Z,2):P
    RINT TAB(10):INPUTD$(Z):RETURN
                                     :rem 204
270 REM DISK SUBROUTINES             :rem 11
280 REM GET INDEX FILE               :rem 246
290 OPEN1,8,0,"0:"+F$+".INDX,S,R":GOSUB11
    0                                :rem 70
300 FORN=1TO600:INPUT#1,TB%(1,N),TB%(2,N)
    :IFST>64THENR=N-1:CLOSE1:RETURN
                                     :rem 209
310 IFN>RMTHENPRINT"INCREASE MAX RUN#":GO
    TO221                            :rem 158
320 NEXTN                            :rem 34
330 REM SAVE INDEX FILE              :rem 65
340 OPEN1,8,1,"@0:"+F$+".INDX,S,W":GOSUB1
    10                               :rem 136
350 FORN=1TOR:PRINT#1,TB%(1,N)CR$TB%(2,N)
    :GOSUB110:NEXTN:CLOSE1:CLOSE15:RETURN
                                     :rem 195
360 REM FIND NEXT FREE TRACK & BLOCK
                                      :rem 5
370 T=1:B=1                          :rem 70
380 PRINT#15,"B-A:"0;T;B:INPUT#15,A,B$,C,
    D:IFA=65THENT=C:B=D:GOTO380      :rem 56
390 TB%(1,P)=T:TB%(2,P)=B            :rem 89
400 REM WRITE RUN# P                 :rem 107
410 PRINT#2,D$(1)Q$D$(2)Q$D$(3)Q$D$(4)Q$D
    $(5)                             :rem 19
420 PRINT#15,"B-W:"2;0;TB%(1,P);TB%(2,P):
    RETURN                           :rem 188
430 REM READ RUN# P                  :rem 255
440 T=TB%(1,P):B=TB%(2,P):PRINT#15,"B-R:"
    2;0;T;B                          :rem 185
450 INPUT#2,D$(1),D$(2),D$(3),D$(4),D$(5)
    :RETURN                          :rem 16
460 REM END DISK SUBROUTINES         :rem 227
470 REM SELECTION                    :rem 37
480 PRINTCL$D1$TAB(10)R$"SELECTION CRITER
    IA"RF$                           :rem 109
490 PRINTD2$TAB(10)"ENTER #,OPTION,VALUE"
    D2$                              :rem 122
500 FORX=1TO5:FORZ=1TO5:PRINTTAB(12)"#";Z
    ;"IS FOR ";C$(Z,1):NEXTZ          :rem 168
510 PRINTTAB(7)D2$"OPTIONS ";OM$:N%(X)=0
                                     :rem 74
511 INPUT"{DOWN}{7 SPACES}";N%(X),OP$(X),
    VL$(X):PRINTCL$                  :rem 128
520 IFN%(X)=0THENX=X-1:RETURN        :rem 67
530 NEXTX:RETURN                     :rem 73
540 REM CALC PACE                    :rem 169
550 MI=VAL(MID$(TM$,1,2))*60+VAL(MID$(TM$
    ,3,2))                           :rem 48
560 MI=MI+VAL(MID$(TM$,5,2))/60:PRINTTAB(
    5)DS$"MI";:PA=MI/VAL(DS$)        :rem 123
570 PM=INT(PA):PS=INT((PA-PM)*60):TM$=STR
    $(PM):A=LEN(TM$):B$=STR$(PS)     :rem 183
580 D=LEN(B$):DS$="":IFD=2THENDS$="0"
                                     :rem 65
590 PRINT"..."MID$(TM$,2,A-1)":"DS$MID$(B
    $,2,D-1)" PACE":RETURN           :rem 199
600 REM CALC DAY#                    :rem 142
610 U=VAL(LEFT$(DY$,2)):IFU<1ORU>12THENPR
    INTT"BAD MONTH";DY$:GOTO221      :rem 227
620 DA=DM%(U)+VAL(RIGHT$(DY$,2))*365+VAL(
    MID$(DY$,3,2)):RETURN            :rem 53
630 REM KEEP HIM HONEST              :rem 81
640 REM DATAENTRY                    :rem 42
650 PRINTCL$TAB(10)"ENTER DATA ON RUN # "
    ;P                               :rem 128
660 FORZ=1TO5:D$(Z)=""               :rem 241
670 GOSUB260:IF(LEN(D$(Z))<>6)AND((Z=1)OR
    (Z=3))THENPRINT"BAD DATA":GOTO670
                                     :rem 172
```

```
680 NEXTZ:GOSUB370:RETURN                    :rem 165
690 REM CREATE A FILE                        :rem 152
700 INPUT"{2 DOWN}{2 SPACES}NAME";F$:OPEN
    15,8,2,F$+".INDX,S,R":OPEN11,8,15:INP
    UT#11,A$,B$,C$                           :rem 19
710 IFB$<>"FILE NOT FOUND"THEN1400
                                             :rem 204
720 CLOSE11:CLOSE15:OPEN15,8,15:OPEN2,8,2
    ,"#"                                     :rem 66
730 FORP=1TORM:GOSUB650:GOSUB200:IFB$="Y"
    THENNEXTP                                :rem 233
740 R=P:GOSUB340:CLOSE2:GOTO90               :rem 137
750 REM ADD AN ENTRY                         :rem 106
760 GOSUB230:IFR+1>RMTHEN100                 :rem 198
770 R=R+1:P=R:GOSUB650                       :rem 73
780 GOSUB340:CLOSE2:PRINTCL$:GOTO90
                                             :rem 238
790 REM MODIFY RUN# P                        :rem 180
800 GOSUB210:CLOSE2:OPEN2,8,2,"#":IFP>RTH
    EN100                                    :rem 233
810 GOSUB440:PRINT"{CLR}":GOSUB240
                                             :rem 159
820 Z=0:PRINTD1$TAB(5):INPUT"(0=END) MODI
    FY #";Z                                  :rem 65
821 IFZ>=6THENPRINT"{UP}{15 SPACES}BAD #
    {13 SPACES}":GOTO820                     :rem 189
830 IFZ=0THENPRINTCL$:GOSUB410:CLOSE2:CLO
    SE15:GOTO90                              :rem 131
840 GOSUB260:GOTO820                         :rem 193
850 REM DELETE AN ENTRY                      :rem 85
860 GOSUB210:IFP>RTHEN100                    :rem 26
870 PRINT#15,"B-F:"0;TB%(1,P);TB%(2,P)
                                             :rem 45
880 IF P<RTHEN FORZ=P+1TOR:TB%(1,Z-1)=TB%
    (1,Z):TB%(2,Z-1)=TB%(2,Z):NEXTZ
                                             :rem 230
890 R=R-1:PRINTCL$:GOSUB340:CLOSE2:GOTO90
                                             :rem 105
900 REM ANALYSIS ROUTINES                    :rem 90
910 REM SHOW RESULTS                         :rem 241
920 GOSUB230:GOSUB480                        :rem 6
930 WM=0:WT=0:BG=0:PRINTD2$TAB(4)"
    {3 DOWN}ENTER {RVS}1{OFF} LIST
    {2 SPACES}{RVS}2{OFF} PACE{2 SPACES}
    {RVS}3{OFF} PLOT"                        :rem 247
940 INPUT"{DOWN}{4 SPACES}";TX:PRINTCL$:I
    FTX<>3THEN960                            :rem 211
950 PRINTCL$D1$TAB(3)"{2 DOWN}SET SCALE..
    .ONE * = HOW MANY MILES"                 :rem 252
951 INPUT"{DOWN}{3 SPACES}";SC:SC=1/SC
                                             :rem 88
960 FORP=1TOR:GOSUB440:IFX=0THEN1070
                                             :rem 16
970 REM LOGICAL SELECTION                    :rem 37
980 FL=1:FORW=1TOX:N=N%(W)                   :rem 98
985 IF(N=1)OR(N=2)OR(N=3)THEN1041:rem 150
990 IFOP$(W)="EQ"THENIFD$(N)<>VL$(W)THENF
    L=0:GOTO1050                             :rem 199
1000 IFOP$(W)="NE"THENIFD$(N)=VL$(W)THENF
     L=0:GOTO1050                            :rem 166
1010 IFOP$(W)="LT"THENIFD$(N)>=VL$(W)THEN
     FL=0:GOTO1050                           :rem 242
1020 IFOP$(W)="GT"THENIFD$(N)<=VL$(W)THEN
     FL=0:GOTO1050                           :rem 236
1030 IFOP$(W)="LE"THENIFD$(N)>VL$(W)THENF
     L=0:GOTO1050                            :rem 168
1040 IFOP$(W)="GE"THENIFD$(N)<VL$(W)THENF
     L=0:GOTO1050                            :rem 162
1041 D=VAL(D$(N)):V=VAL(VL$(W))              :rem 241
1042 IFOP$(W)="EQ"THENIFD<>VTHENFL=0:GOTO
     1050                                    :rem 17
1043 IFOP$(W)="NE"THENIFD=VTHENFL=0:GOTO1
     050                                     :rem 210
1044 IFOP$(W)="LT"THENIFD>=VTHENFL=0:GOTO
     1050                                    :rem 30
1045 IFOP$(W)="GT"THENIFD<=VTHENFL=0:GOTO
     1050                                    :rem 24
1046 IFOP$(W)="LE"THENIFD>VTHENFL=0:GOTO1
     050                                     :rem 212
1047 IFOP$(W)="GE"THENIFD<VTHENFL=0:GOTO1
     050                                     :rem 206
1050 NEXTW                                   :rem 92
1060 IFFL=0THEN1260                          :rem 77
1070 ONTXGOTO1090,1120,1180                  :rem 250
1080 REM LIST                                :rem 233
1090 PRINT"{10 SPACES}"R$"RUN # "RF$;P;D1
     $:GOSUB240:PRINTD2$D1$:GOSUB250
                                             :rem 35
1100 GOTO1260                                :rem 196
1110 REM PACE                                :rem 192
1120 DY$=D$(1):GOSUB610:IFBG=0THENBG=DA
                                             :rem 54
1130 TM$=D$(3):DS$=D$(2):GOSUB550:WM=WM+M
     I/PA:WT=WT+MI:IFDA<BG+6THEN1150
                                             :rem 92
1140 BG=BG+7:DS$=STR$(WM):MI=WT:PRINTR$DS
     $"MI/WK"RF$;:GOSUB570:WT=0:WM=0
                                              :rem 0
1150 IFWT=0THENGOSUB250                      :rem 180
1160 GOTO1260                                :rem 202
1170 REM GRAPH                               :rem 31
1180 DY$=D$(1):GOSUB610:IFBG=0THENBG=DA:E
     =0                                      :rem 40
1190 N0=DA-BG:BG=DA:IFN0<2THEN1210
                                             :rem 238
1200 FORZ=2TON0:PRINT"0":E=E+1:NEXT
                                             :rem 165
1210 NS=INT(VAL(D$(2))*SC+.5):B$="*":IFNS
     =1THEN1240                              :rem 100
1220 IFNS>23THENNS=23                        :rem 10
1230 FORZ=2TONS:B$=B$+"*":NEXTZ              :rem 105
1240 PRINTB$:E=E+1:IFE>15THENE=0:GOSUB250
                                             :rem 251
1250 IFE=0THENFORZ=1TO16:PRINT" ";:NEXT:P
     RINT"{2 UP}"                            :rem 221
1260 NEXTP                                   :rem 88
1270 CLOSE1:CLOSE2:CLOSE15                   :rem 105
1280 IFTX<>1THENGOSUB250                     :rem 247
1290 GOTO90                                  :rem 110
1300 DATA0,31,59,90,120,151,181,212,243,2
     73,304,334                              :rem 236
1310 DATADATE,DISTANCE,TIME,ROUTE,COMMENT
     S,(MMDDYY),(MILES),(HHMMSS)             :rem 177
1320 DATA(< 80 CHRS),(< 80 CHRS)             :rem 86
1400 PRINT"{DOWN}{2 SPACES}"F$" ALREADY E
     XISTS{5 UP}{16 SPACES}":CLOSE11:CLOS
     E15:GOTO700                             :rem 62
```

Alien Armada

(Article on page 46.)

Program 1: Alien Armada—VIC Version (BASIC Loader)

```
10 ZZ=36878:A=36879:B=700:C=.:RESTORE
                                             :rem 193
20 POKEZZ,15                                 :rem 215
30 POKEA,8:PRINTCHR$(14)"{CLR}{WHT}";TAB(
   5)"{RVS}ALIEN ARMADA{3 DOWN}"             :rem 193
```

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

```
40 PRINT"{RED}CHOOSE A NUMBER:{DOWN}":PRI
   NTTAB(5)"{PUR}1) DESCRIPTION{DOWN}":PR
   INTTAB(5)"2) SCORING{DOWN}"    :rem 131
50 PRINTTAB(5)"3) CONTROLS{DOWN}":PRINTTA
   B(5)"4) LOAD GAME{DOWN}":PRINTTAB(5)"5
   ) EXIT{2 DOWN}"                :rem 166
60 PRINT"{RED}WHICH ONE?"         :rem 103
70 FORJ=1TO2:RESTORE:FORD=1TO6:READE:POKE
   36875,E:FORT=1TO200:NEXTT:NEXTD:NEXTJ
                                  :rem 204
80 GETX$:IFX$=""THEN80            :rem 33
90 IFX$="1"THEN150                :rem 235
100 IFX$="2"THEN230               :rem 19
110 IFX$="3"THEN350               :rem 24
120 IFX$="4"THEN420               :rem 24
130 IFX$="5"THEN470               :rem 31
140 RESTORE:GOTO80                :rem 148
150 POKEA,59:PRINT"{CLR}{BLK}{DOWN}
    {5 SPACES}{RVS}DESCRIPTION":POKEZZ,0
                                  :rem 46
160 PRINT"{2 DOWN}{2 SPACES}YOU, A ZARGIA
    N STAR WARRIOR, MUST DEFEND{2 SPACES}
    YOUR HOME BY WARDING"         :rem 154
170 PRINT"OFF THE GORG FORCES.{2 SPACES}Y
    OUR ULTIMATE GOAL IS TO SHOOT THROUGH
     THE"                         :rem 233
180 PRINT"ALIENS AND DESTROY{4 SPACES}THE
     GORG MOTHERSHIP.{4 SPACES}EACH ALIEN
     HAS THREE";                  :rem 109
190 PRINT"LIVES. BIRDS, BOMBS,{2 SPACES}A
    ND ALIENS SWOOP DOWN TO DESTROY YOU."
                                  :rem 50
200 PRINT"{2 SPACES}CAN YOU SURVIVE?":PRI
    NT"{2 DOWN} PRESS {RVS}C{OFF} TO CONT
    INUE.{OFF}{UP}"               :rem 159
210 GETX$:IFX$<>"C"THEN210        :rem 247
220 GOTO10                        :rem 46
230 POKEA,10:POKEZZ,0:PRINT"{CLR}";TAB(7)
    ;"{WHT}{2 DOWN}{RVS}SCORING" :rem 144
240 PRINT"{2 DOWN}ALIEN{8 SPACES}10{DOWN}
    ":PRINT"ATTACKING":PRINT"ALIEN
    {8 SPACES}1000"               :rem 186
250 PRINT"{DOWN}BIRD{9 SPACES}100{DOWN}":
    PRINT"BOMB{9 SPACES}10{DOWN}":rem 217
260 PRINT"MOTHERSHIP{3 SPACES}2000-5000"
                                  :rem 160
270 PRINT"{RIGHT}{3 DOWN}PRESS {RVS}C
    {OFF} TO CONTINUE."           :rem 228
280 GETX$:IFX$<>"C"THEN280          :rem 5
290 PRINT"{CLR}{5 DOWN}{2 SPACES}THE ATTA
    CKING ALIENSAPPEAR WHEN THE PLAYER"
                                  :rem 160
300 PRINT"{UP}HAS REACHED A TOTAL OF10,00
    0 POINTS.{2 DOWN}":PRINT"{2 SPACES}SK
    ILL LEVELS 0-4"               :rem 199
310 PRINT"{2 SPACES}START WITH 6 SHIPS.
    {DOWN}":PRINT"{2 SPACES}SKILL LEVELS
    {SPACE}5-9{6 SPACES}START WITH 3 SHIP
    S.{DOWN}"                     :rem 94
320 PRINT"{2 DOWN} PRESS {RVS}C{OFF} TO C
    ONTINUE."                     :rem 178
330 GETX$:IFX$<>"C"THEN330        :rem 253
340 GOTO10                        :rem 49
350 POKEA,125:POKEZZ,0:PRINT"{CLR}{BLK}";
    TAB(7);"{DOWN}{RVS}CONTROLS" :rem 163
360 PRINT"{2 DOWN}{7 SPACES}KEYBOARD":PRI
    NT"{DOWN}{3 SPACES}{RVS}L{OFF}-LEFT
    {2 SPACES}{RVS};{OFF}-RIGHT"  :rem 75
370 PRINTTAB(8)"{RVS}S{OFF}-FIRE":PRINT"
    {2 DOWN}{2 SPACES}OR USE THE JOYSTICK
     TO MOVE THE SHIP."           :rem 190
380 PRINT"{DOWN}{2 SPACES}CHOOSE SKILL LE
    VELS WITH NUMERIC KEYS ON{2 SPACES}TH
    E KEYBOARD."                  :rem 144
390 PRINT"{2 DOWN} PRESS {RVS}C{OFF} TO C
    ONTINUE."                     :rem 185
400 GETX$:IFX$<>"C"THEN400        :rem 249
410 GOTO10                        :rem 47
420 POKEZZ,0:POKEA,108:PRINT"{CLR}{WHT}
    {8 DOWN}{3 SPACES}LOADING PART TWO";"
    {DOWN}{8 SPACES}PLEASE WAIT{2 DOWN}"
                                  :rem 191
430 PRINTTAB(6)"{2 DOWN}GOOD LUCK!":RESTO
    RE:FORA=1TO6:READB:NEXT:FORA=7168TO74
    31                            :rem 224
440 READB:POKEA,B:NEXT            :rem 135
450 FORA=7552TO7631:READB:POKEA,B:NEXT
                                  :rem 110
460 LOAD"AA",8,1:END               :rem 82
470 POKEZZ,0:END                  :rem 235
480 DATA233,236,231,223,231,0     :rem 184
490 DATA34,20,99,20,34,119,99,65,0,65,34,
    20,20,8,0,0,8,8,8,8           :rem 181
500 DATA20,34,20,34,73,42,0,99,0,42
                                  :rem 213
510 DATA73,0,126,90,126,90,126,90,36,24,2
    8,8,28,20,20,20,28,8          :rem 223
520 DATA60,24,60,44,44,44,60,24,240
                                  :rem 221
530 DATA8,4,2,3,15,60,248,31,63,106,234,1
    70,226,127,62,248,252,70,215,85,199,2
    54,124,15                     :rem 240
540 DATA16,32,64,192,240,60,31,221,222,23
    9,247,255,247,115,33          :rem 233
550 DATA127,252,240,231,255,223,142
                                  :rem 229
560 DATA4,254,63,15,231,255,251,113,32,18
    7,123,247,239,255              :rem 96
570 DATA239,206,132,18,9,23,36,18,146
                                   :rem 86
580 DATA73,36,73,73,40,165,148,85,64,0,41
    ,41,74,18,84,85,1             :rem 106
590 DATA0,16,36,72,81,146,37,73,18,144
                                  :rem 135
600 DATA37,73,210,20,101,9,2,0,64,85,149,
    148,37,8,41,0,1,85            :rem 121
610 DATA84,18,74,74,41,2,18,73,37,164
                                  :rem 87
620 DATA146,72,64,0,0,36,24,24,36,0,0,4,2
    ,2,6,24,32,192,0              :rem 251
630 DATA193,38,24,0,0,0,0,0,216,39,3,0
                                  :rem 93
640 DATA0,0,0,0,6,200,48,0,0,0,0,0,204,11
    0,168,200,220,238              :rem 14
650 DATA206,12,24,60,126,90,90,126,60
                                  :rem 70
660 DATA34,0,36,24,126,90,126,36,96,24,60
    ,66,165,129,90,60,0,0,0,0,0,0,0,0,0,6
    0,126,102                     :rem 180
670 DATA102,102,102,126,60,24,56,120,24,2
    4,24,60,126,24,60             :rem 56
680 DATA102,6,12,24,62,126,60,126,6,28
                                  :rem 118
690 DATA6,6,62,124,4,12,28,52,126,12,12,1
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    2,62,124,96,108,54              :rem 126
700 DATA2,102,60,28,62,96,96,124,102
                                    :rem 22
710 DATA102,60,60,126,102,12,12,24,24,48,
    60,102,102,60,102,102,102,60,60,126,1
    02,126,62                       :rem 167
720 DATA12,24,48                    :rem 64
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Program 2: Alien Armada—VIC Version (requires MLX)

See instructions in article before entering.

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4097 :011,016,002,000,158,052,240
4103 :051,053,050,000,041,016,218
4109 :003,000,158,052,054,052,076
4115 :049,058,151,056,049,044,170
4121 :181,040,049,050,172,187,192
4127 :040,049,041,170,052,041,168
4133 :058,137,051,000,000,000,027
4139 :076,073,000,000,000,000,192
4145 :000,002,234,173,038,002,242
4151 :024,233,048,201,007,176,232
4157 :003,076,246,023,173,042,112
4163 :002,201,006,176,006,238,184
4169 :042,002,076,014,024,169,144
4175 :005,141,042,002,076,246,079
4181 :023,160,000,162,000,202,120
4187 :208,253,136,208,250,096,218
4193 :234,234,234,169,000,141,085
4199 :019,145,141,034,145,173,248
4205 :032,145,041,128,201,128,016
4211 :176,006,032,144,016,076,053
4217 :085,024,173,017,145,041,094
4223 :016,201,016,176,006,032,062
4229 :144,016,076,074,024,032,243
4235 :144,016,076,179,016,169,227
4241 :255,141,019,145,141,034,112
4247 :145,096,169,000,141,019,209
4253 :145,173,017,145,041,032,198
4259 :201,032,240,006,032,144,050
4265 :016,076,022,024,032,144,227
4271 :016,076,192,016,165,197,069
4277 :201,021,240,206,201,022,048
4283 :240,187,076,014,024,165,125
4289 :197,201,041,240,228,076,152
4295 :129,019,000,000,000,000,091
4301 :000,234,234,169,240,141,199
4307 :010,144,141,011,234,234,217
4313 :169,240,141,010,144,141,038
4319 :011,144,141,012,144,141,048
4325 :013,144,165,162,197,162,048
4331 :240,250,206,010,144,206,011
4337 :011,144,206,012,144,206,196
4343 :013,144,173,013,144,201,167
4349 :127,208,231,169,147,032,143
4355 :210,255,169,008,141,015,033
4361 :144,169,242,141,005,144,086
4367 :169,083,141,001,030,169,096
4373 :011,141,002,030,169,009,127
4379 :141,003,030,169,012,141,011
4385 :004,030,141,005,030,169,156
4391 :040,141,006,030,169,048,217
4397 :141,007,030,169,045,141,066
4403 :008,030,169,057,141,009,209
4409 :030,169,041,141,010,030,222
4415 :169,063,141,012,030,032,254
4421 :159,255,032,228,255,201,175
4427 :048,048,246,201,058,016,180
4433 :242,141,038,002,201,053,246
4439 :016,007,169,006,133,251,157
4445 :076,100,017,169,003,133,079
4451 :251,169,015,141,014,144,065
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4463 :032,217,018,169,231,141,151
4469 :011,144,032,086,016,234,128
4475 :234,169,005,141,042,002,204
4481 :133,252,076,217,017,173,229
4487 :234,031,201,049,176,003,061
4493 :076,003,024,166,253,164,059
4499 :254,032,064,024,224,021,254
4505 :240,047,228,002,240,030,172
4511 :232,196,001,144,017,136,117
4517 :032,226,017,169,159,032,032
4523 :210,255,169,094,032,210,117
4529 :255,076,185,017,200,076,218
4535 :165,017,228,002,208,004,039
4541 :196,003,240,003,076,242,181
4547 :017,238,235,031,076,249,017
4553 :017,196,001,208,025,169,049
4559 :005,133,253,165,081,133,209
4565 :254,076,078,023,169,005,050
4571 :133,253,133,254,076,237,025
4577 :021,024,032,240,255,096,125
4583 :169,005,133,253,165,001,189
4589 :133,254,076,134,017,134,217
4595 :253,132,254,076,003,024,217
4601 :169,005,133,253,076,128,245
4607 :018,169,008,141,000,028,107
4613 :169,028,141,001,028,169,029
4619 :020,141,002,028,169,028,143
4625 :141,003,028,169,127,141,114
4631 :004,028,169,119,141,005,233
4637 :028,076,217,016,174,017,045
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4661 :032,210,255,169,070,032,053
4667 :210,255,142,017,003,140,058
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4715 :173,237,031,201,057,016,054
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4727 :141,237,031,238,236,031,009
4733 :076,222,023,165,001,133,233
4739 :254,076,128,023,173,235,252
4745 :031,201,058,176,003,076,170
4751 :177,018,169,048,141,235,163
4757 :031,141,236,031,141,237,198
4763 :031,238,234,031,173,234,072
4769 :031,201,058,208,011,169,071
4775 :048,141,234,031,169,200,222
4781 :141,012,144,234,165,251,096
4787 :024,237,016,003,024,105,076
4793 :048,141,244,031,165,161,207
4799 :201,015,144,004,169,000,212
4805 :133,161,173,038,002,141,077
4811 :228,031,076,153,025,141,089
4817 :235,031,238,234,031,076,030
4823 :156,018,169,233,141,011,175
4829 :144,032,086,016,169,236,136
4835 :141,011,144,032,086,016,145
4841 :169,231,141,011,144,032,193
4847 :086,016,169,223,141,011,117
4853 :144,032,086,016,096,234,085
4859 :234,234,234,234,234,169,054
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4871 :141,091,028,169,063,141,128
4877 :092,028,169,030,141,093,054
4883 :028,169,076,141,094,028,043
4889 :169,136,141,095,028,169,251
4895 :231,141,097,028,141,105,006
4901 :028,169,240,141,098,028,229
4907 :169,252,141,099,028,169,133
4913 :251,141,101,028,169,113,084
4919 :141,102,028,169,032,141,156
4925 :103,028,169,015,141,106,111
4931 :028,169,063,141,107,028,091
4937 :169,223,141,109,028,169,144
4943 :142,141,110,028,169,004,161
4949 :141,111,028,169,059,141,222
4955 :112,028,169,238,141,115,126
4961 :028,169,252,141,116,028,063
4967 :169,120,141,117,028,169,079
4973 :050,141,118,028,169,017,120
4979 :141,119,028,169,007,141,208
4985 :010,150,141,011,150,076,147
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5015 :252,076,114,024,169,005,023
5021 :133,252,169,005,133,252,077
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5033 :228,009,240,004,228,078,188
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5075 :134,009,164,081,132,080,043
5081 :076,128,023,162,005,134,233
5087 :078,164,081,132,079,076,065
5093 :128,023,201,009,240,216,022
5099 :197,252,208,209,076,155,052
5105 :019,234,234,002,155,002,119
5111 :023,169,005,141,010,150,233
5117 :141,011,150,169,008,141,105
5123 :057,028,169,004,141,058,204
5129 :028,169,002,141,059,028,180
5135 :169,015,141,061,028,141,058
5141 :080,028,169,248,141,063,238
5147 :028,169,016,141,081,028,234
5153 :169,032,141,082,028,169,142
5159 :064,141,083,028,169,240,252
5165 :141,056,028,141,085,028,012
5171 :169,031,141,087,028,169,164
5177 :220,141,088,028,169,247,182
5183 :141,091,028,141,093,028,073
5189 :169,115,141,094,028,169,017
5195 :033,141,095,028,169,252,025
5201 :141,097,028,169,240,141,129
5207 :098,028,169,231,141,099,085
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5219 :141,101,028,169,142,141,053
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5237 :169,015,141,106,028,169,233
5243 :251,141,109,028,169,113,166
5249 :141,110,028,169,032,141,238
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5279 :028,169,255,141,092,028,104
5285 :169,187,141,112,028,169,203
5291 :255,141,116,028,169,127,239
5297 :141,096,028,169,248,141,232
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5327 :028,169,016,141,056,028,133
5333 :169,048,141,057,028,169,057
5339 :249,141,063,028,169,008,109
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5351 :081,028,169,018,141,082,238
5357 :028,169,033,141,083,028,207
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5387 :010,144,169,208,141,013,184
5393 :144,162,015,160,000,138,124
5399 :153,009,030,169,007,153,032
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5411 :208,241,160,000,138,153,167
5417 :031,030,169,007,153,031,206
5423 :150,232,200,192,004,208,009
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5453 :169,200,141,013,144,196,172
5459 :162,208,252,169,000,141,247
5465 :013,144,232,224,066,208,208
5471 :216,165,160,201,025,048,142
5477 :009,238,235,031,238,235,063
5483 :031,076,126,021,238,235,066
5489 :031,238,235,031,238,235,097
5495 :031,238,235,031,238,235,103
5501 :031,173,235,031,201,057,085
5507 :048,011,169,048,141,235,015
5513 :031,238,234,031,238,235,120
5519 :031,076,063,022,000,234,057
5525 :165,160,201,100,016,006,029
5531 :238,235,031,076,189,021,177
5537 :201,200,016,009,238,235,036
5543 :031,238,235,031,076,189,199
5549 :021,238,235,031,238,235,147
5555 :031,238,235,031,238,235,163
5561 :031,238,235,031,173,235,104
5567 :031,201,057,048,008,169,193
5573 :048,141,235,031,238,234,100
5579 :031,076,128,022,169,121,238
5585 :141,013,144,169,000,133,041
5591 :162,238,013,144,164,162,074
5597 :192,005,048,247,076,137,158
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5609 :085,076,074,026,169,255,150
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5621 :147,032,210,255,076,224,165
5627 :022,234,076,000,022,169,006
5633 :147,032,210,255,162,007,046
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5693 :210,255,160,000,169,029,116
5699 :153,044,030,200,192,066,240
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5723 :234,234,234,234,173,016,192
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5735 :020,141,003,028,169,034,242
5741 :141,004,028,076,115,022,239
5747 :169,020,141,001,028,169,131
5753 :099,141,002,028,076,159,114
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5819 :133,087,076,248,022,169,154
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5849 :002,153,000,150,200,192,146
5855 :110,169,048,141,234,031,188
5861 :141,235,031,141,236,031,020
5867 :141,237,031,141,238,031,030
5873 :076,205,022,234,076,248,078
5879 :022,169,021,133,000,169,249
5885 :003,133,001,169,011,141,199
5891 :015,144,169,128,141,138,226
5897 :002,162,005,160,010,169,005
5903 :253,133,090,169,001,133,026
5909 :002,169,002,133,003,169,243
5915 :005,133,005,133,006,133,186
5921 :009,133,078,133,087,169,130
5927 :010,133,080,169,015,133,067
5933 :088,133,079,169,003,141,146
5939 :018,003,169,000,133,004,122
5945 :133,089,169,005,141,017,099
5951 :003,169,015,141,014,144,037
5957 :169,000,133,161,133,160,057
5963 :096,234,234,166,000,164,201
5969 :001,024,032,240,255,169,034
5975 :028,032,210,255,169,067,080
5981 :032,210,255,169,000,141,132
5987 :013,144,238,016,003,173,174
5993 :016,003,197,251,208,003,015
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6029 :013,144,166,002,164,003,121
6035 :024,032,240,255,169,028,127
6041 :032,210,255,169,067,032,150
6047 :210,255,162,020,164,001,203
6053 :134,002,132,003,076,193,193
6059 :023,169,048,141,236,031,051
6065 :238,235,031,169,048,141,015
6071 :237,031,169,200,141,012,205
6077 :144,096,234,234,162,006,041
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6089 :210,255,169,068,032,210,121
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6107 :076,131,023,173,017,003,130
6113 :201,020,208,010,169,005,070
6119 :141,017,003,165,002,141,188
6125 :018,003,076,131,023,234,210
6131 :234,234,234,162,000,142,225
6137 :012,144,162,000,142,013,210
6143 :144,076,134,017,166,000,024
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6155 :234,234,234,166,002,164,021
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Program 3: Alien Armada—64 Version (requires MLX)

Translation by Kevin Martin

See instructions in article before entering.

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3867 :042,176,022,173,074,008,010
3873 :205,077,008,240,004,144,199
3879 :030,176,010,173,073,008,253
3885 :205,076,008,240,020,144,226
3891 :018,173,073,008,141,076,028
3897 :008,173,074,008,141,077,026
3903 :008,173,075,008,141,078,034
3909 :008,096,238,088,008,173,168
3915 :088,008,041,016,240,005,217
3921 :162,000,076,088,015,162,072
3927 :005,189,076,016,141,079,081
3933 :048,232,189,076,016,141,027
3939 :071,048,232,189,076,016,219
3945 :141,025,048,141,033,048,029
3951 :141,041,048,141,049,048,067
3957 :232,189,076,016,141,026,029
3963 :048,141,034,048,141,042,065
3969 :048,141,050,048,232,189,069
3975 :076,016,141,027,048,141,072
3981 :035,048,141,043,048,141,085
3987 :051,048,076,049,234,172,009
3993 :087,008,162,000,202,208,052
3999 :253,136,208,250,096,147,225
4005 :014,159,032,200,201,199,202
4011 :200,058,032,005,048,048,050
4017 :048,048,048,048,048,031,192
4023 :032,032,032,032,032,032,119
4029 :032,032,032,032,032,032,125
4035 :032,032,193,204,201,197,030
```

```
4041 :206,032,193,210,205,193,216
4047 :196,193,151,017,017,017,030
4053 :017,017,017,017,017,017,059
4059 :017,017,017,032,032,032,110
4065 :032,032,032,032,032,032,161
4071 :032,195,200,207,207,211,003
4077 :197,032,204,197,214,197,254
4083 :204,032,040,048,045,057,157
4089 :041,063,000,019,031,211,102
4095 :195,207,210,197,058,032,130
4101 :005,048,048,048,048,048,250
4107 :048,048,000,005,000,000,112
4113 :000,000,041,000,005,030,093
4119 :000,000,000,011,000,005,039
4125 :007,000,000,000,041,000,077
4131 :000,000,000,015,005,208,007
4137 :210,197,211,211,160,211,217
4143 :208,193,195,197,160,212,188
4149 :207,032,208,204,193,217,090
4155 :032,193,199,193,201,206,059
4161 :000,050,045,040,035,030,009
4167 :035,030,025,020,015,096,036
4173 :034,065,034,020,006,068,048
4179 :000,000,099,158,076,077,237
4185 :078,079,017,157,157,157,222
4191 :157,080,081,082,083,000,066
4197 :034,020,099,020,034,119,171
4203 :099,065,126,090,126,090,191
4209 :126,090,036,024,060,024,217
4215 :060,044,044,044,060,024,139
4221 :000,065,034,020,020,008,016
4227 :000,000,000,065,034,020,250
4233 :020,008,000,000,000,065,230
4239 :034,020,020,008,000,000,225
4245 :000,065,034,020,020,008,040
4251 :000,000,008,008,008,008,187
4257 :020,034,020,034,024,060,097
4263 :126,090,090,126,060,034,181
4269 :000,036,024,126,090,126,063
4275 :036,096,024,060,066,165,114
4281 :129,090,060,000,073,042,067
4287 :000,099,000,042,073,000,149
4293 :240,008,004,002,003,015,213
4299 :060,248,031,063,106,234,177
4305 :170,226,127,062,248,252,014
4311 :070,215,085,199,254,124,138
4317 :015,016,032,064,192,240,012
4323 :060,031,221,222,239,247,223
4329 :255,247,115,033,127,252,238
4335 :240,231,255,223,142,004,054
4341 :254,063,015,231,255,251,034
4347 :113,032,187,123,247,239,168
4353 :255,239,206,132,018,009,092
4359 :023,036,018,146,073,036,083
4365 :073,073,040,165,148,085,085
4371 :064,000,041,041,074,018,001
4377 :084,085,001,000,016,036,247
4383 :072,081,146,037,073,018,202
4389 :144,037,073,210,020,101,110
4395 :009,002,000,064,085,149,096
4401 :148,037,008,041,000,001,028
4407 :085,084,018,074,074,041,175
4413 :002,018,073,037,164,146,245
4419 :072,064,013,013,013,013,255
```

The Enchanted Journey

(Article on page 40.)

See instructions in article before entering.

BEFORE TYPING . . .

Before typing in programs, please refer to "How To Type In COMPUTE!'s GAZETTE Programs," which appears before the Program Listings.

Program 1

```
1 POKE36879,42:PRINT"{CLR}"          :rem 161
2 POKE642,24:POKE44,24:POKE46,24:POKE6144
  ,0:POKE6145,0:POKE6146,0:CLR       :rem 49
3 PRINT"FOR TAPE, PRESS PLAY";       :rem 63
4 S$="LO"+CHR$(34)+"Y"+CHR$(34)+",8:"+CHR
  $(131)                             :rem 246
5 FORI=1TOLEN(S$):POKE630+I,ASC(MID$(S$,I
  )):NEXT:POKE198,I:END              :rem 44
```

Program 2: "Y" (The Enchanted Journey)

```
0 POKE36878,15:FORI=1TO184:READA:X=X+A:NE
  XT:RESTORE                         :rem 26
1 IFX<>18668THENPRINT"ERROR IN DATA STATE
  MENTS.":STOP                       :rem 144
2 PRINT"{CLR}{YEL}{11 DOWN}{2 RIGHT}ENCHA
  NTED{2 SPACES}JOURNEY":POKE36879,11
                                     :rem 231
3 PRINT"{4 RIGHT}{DOWN}JUST A MINUTE..."
                                     :rem 108
4 READA,B:IFA=-1THEN6                :rem 9
5 POKE36874,A:POKE36876,A:FORT=15TO1STEP-
  1:FORC=1TOB/6:POKE36878,T:NEXT:NEXT:GOT
  O4                                 :rem 245
6 PRINT"{4 RIGHT}{DOWN}ENTERING DATA":FOR
  I=5120TO5631:POKEI,PEEK(I+27648):NEXT
                                     :rem 47
7 FORT=5120TO5279:READL:POKET,L:NEXT:PRIN
  T"{BLK}"                           :rem 220
8 PRINT"FOR TAPE, PRESS PLAY";       :rem 68
9 S$="LO"+CHR$(34)+"Z"+CHR$(34)+",8:"+CHR
  $(131)                             :rem 252
10 FORI=1TOLEN(S$):POKE630+I,ASC(MID$(S$,
   I)):NEXT:POKE198,I:END            :rem 88
401 DATA236,120,235,120,236,120,235,60,23
    8,60,235,90,232,30,235,90,232,30,235,
    120,0,0                          :rem 94
402 DATA-1,0                         :rem 106
500 DATA 56,56,16,254,16,40,68,130
                                     :rem 136
510 DATA 24,24,24,24,153,90,60,24 :rem 74
520 DATA 0,0,0,0,0,102,102,231   :rem 145
530 DATA 247,247,247,0,127,127,127,0
                                     :rem 235
540 DATA 170,68,170,16,16,16,16,56
                                     :rem 140
550 DATA 28,28,8,8,4,4,8,8           :rem 4
560 DATA 60,126,255,255,255,255,126,60
                                     :rem 87
570 DATA 24,24,24,255,255,24,24,24
                                     :rem 134
```

```
580 DATA 0,0,3,207,51,0,0,0          :rem 13
590 DATA 60,60,60,24,24,24,24,24     :rem 28
600 DATA 247,247,247,3,127,127,127,127
                                     :rem 86
610 DATA 255,255,255,249,249,255,255,255
                                     :rem 203
620 DATA 0,7,253,165,167,0,0,0       :rem 177
630 DATA 126,231,231,129,189,129,255,219
                                     :rem 190
640 DATA 231,231,0,24,36,66,129,126
                                     :rem 180
650 DATA 24,36,66,90,66,36,24,0      :rem 248
660 DATA 30,33,39,39,30,0,16,15      :rem 235
670 DATA 120,132,228,228,120,0,8,240
                                     :rem 221
680 DATA 126,255,189,219,255,126,36,231
                                     :rem 147
690 DATA 32,48,56,60,60,32,32,32     :rem 36
```

Program 3: "Z" (The Enchanted Journey)

```
1 POKE56,63:POKE55,229:CLR:POKE36879,8:OM
  =4                                 :rem 60
2 GOSUB15:BB=Y:GOSUB15:CC=Y:GOSUB15:DD=Y
                                     :rem 90
3 PRINT"{CLR}":RESTORE:FORY=16357TO16383:
  READZ:POKEY,Z:NEXT:GOSUB171:GOTO152
                                     :rem 41
4 POKE36869,205:A=9:B=9:DEFFNC(D)=4096+A+
  22*B                               :rem 5
5 FORZ=1TO3:GOSUB15:E(Z)=Y:NEXT:GG=483
                                     :rem 183
6 POKE36878,15                       :rem 7
7 FORZ=1TO4:GOSUB16:E1(Z)=Y:E2(Z)=E1(Z):N
  EXT:F=33792                        :rem 199
8 G=4096:H=4579:Y=RND(-TI)           :rem 246
9 I=4117:J=4558:GOSUB15:N=Y:N1=INT(RND(.)
  *GG)+G:GOSUB15:EE=Y                :rem 154
10 GOSUB15:CU=Y                      :rem 175
11 GOSUB14:X1=Y:GOSUB14:O1=Y:GOSUB14:P1=Y
   :FORY=832TO936:READZ:POKEY,Z:NEXT
                                     :rem 137
12 GOSUB14:S1=Y:GOSUB14:T1=Y:GOSUB14:U1=Y
   :GOSUB14:V1=Y:GOSUB14:FA=Y:GOSUB14:W1=
   Y                                 :rem 232
13 GOSUB16:BY=Y:BX=Y::GOSUB16:CY=Y:CX=Y:G
   OSUB16:DY=Y:DX=Y:GOSUB16:EY=Y:EX=Y:GOT
   O17                               :rem 35
14 Y=INT(RND(.)*GG)+G:RETURN         :rem 222
15 Y=INT(RND(.)*40)+1:RETURN         :rem 159
16 Y=INT(RND(.)*20)+1:RETURN         :rem 158
17 GOSUB14:Q1=Y:GOSUB14:R1=Y:DEFFNA1(D)=4
   096+E1(Y)+22*E2(Y):DEFFNA2(D)=4096+BX+
   22*BY                             :rem 184
18 DEFFNA3(D)=4096+CX+22*CY:DEFFNA4(D)=40
   96+DX+22*DY:DEFFNA5(D)=4096+EX+22*EY
                                     :rem 171
19 D1=4106:D2=4568:D4=4337:D3=4316:DEFFNA
   7(D)=4096+GH(Z)+22*GZ(Z):TI$="000000"
                                     :rem 231
20 GOSUB263:PRINT"{CLR}":IFK=1ORK=9ORK=17
   ORK>24ANDK<28ORK>32ANDK<38ORK=3THEN261
                                     :rem 92
21 PRINT"{HOME}{RED}CCCCCCCCCCCCCCCCCCCCC
   C"                                :rem 37
22 IFK=12ORK=25ORK=26ORK>32ANDK<37ORK=3OR
   K=6ORK=2THEN24                    :rem 253
23 FORY=ITOHSTEP22:POKEY,3:POKEY+F,2:NEXT
                                     :rem 225
24 IFK=1ORK=9ORK=11ORK=25ORK>32ANDK<36ORK
   =17THEN26                         :rem 165
25 FORY=JTOH:POKEY,3:POKEY+F,2:NEXT
                                     :rem 68
26 IFK=1ORK=3ORK=4ORK=7ORK=9ORK=13ORK=17O
   RK>24ANDK<28ORK>32ANDK<38THEN28
                                     :rem 138
27 FORY=GTOJSTEP22:POKEY,3:POKEY+F,2:NEXT
                                     :rem 229
28 IFK<>10ANDK<>16ANDK<>13ANDK<>25THEN30
                                     :rem 171
29 FORZ=1TOINT(RND(.)*15)+15:Y=INT(RND(.)
   *GG)+G:POKEY,7:POKEY+F,0:NEXT     :rem 67
30 IFK>3ANDK<8ORK=15ORK=18ORK>21ANDK<25OR
   K=32THENPOKED1,11:POKED1+F,0      :rem 73
31 IFK>11ANDK<16ORK=23ORK=26ORK>29ANDK<33
   ORK=40THENPOKED2,11:POKED2+F,0:rem 174
32 IFK=5ORK=15ORK=16ORK>18ANDK<21ORK=22OR
   K=24ORK=29ORK>37ANDK<41THENFL=1:rem 82
33 IFFLTHENPOKED3,11:POKED3+F,0:FL=0
                                     :rem 208
34 IFK=4ORK=14ORK=15ORK=18ORK=19ORK=23ORK
   =28ORK=21ORK>36ANDK<40THENPOKED4,11:PO
   KED4+F,0                          :rem 4
35 IFK=16ANDLK=0THENPOKEH-88,10       :rem 141
36 RR=0:IFK=39ORK=29ORK=31ORK=20THENRR=9
                                     :rem 44
37 IFI(2)=9THEN183                    :rem 6
38 IFK=5THENFORY=GTOHSTEP25:POKEY,3:POKEY
   +F,4:NEXT                         :rem 101
39 IFK=8THENFORY=GTOHSTEP7:POKEY,3:POKEY+
   F,2:NEXT                          :rem 55
40 IFK=16THENFORY=GTOHSTEP18:POKEY,3:POKE
   Y+F,2:NEXT                        :rem 144
41 IFK=12THENFORY=ITOJSTEP21:POKEY,3:POKE
   Y+F,4:NEXT                        :rem 141
42 IFK<>30THEN44                     :rem 180
43 FORY=GTOHSTEP23:POKEY,3:POKEY+F,3:NEXT
   :FORY=ITOJSTEP21:POKEY,3:POKEY+F,3:NEX
   T                                 :rem 155
44 IFK<>18THEN46                     :rem 190
45 FORY=D3TOD4-2:POKEY,3:POKEY+F,2:NEXT:F
   ORY=D3+10TOD2STEP22:POKEY,3:POKEY+F,2:
   NEXT                              :rem 160
46 IFK=20ANDI(7)=9THENPOKED4,9:POKED4+F,3
                                     :rem 233
47 IFK=21ANDI(7)=9THENPOKED3,9:POKED3+F,3
                                     :rem 233
48 IFK=5ANDI(6)=9THENPOKED4,9:POKED4+F,4
                                     :rem 190
49 IFK=6ANDI(6)=9THENPOKED3,9:POKED3+F,4
                                     :rem 190
50 IFK=11THENFORY=D1+44TOD2STEP22:POKEY,3
   :POKEY+F,4:NEXT                   :rem 120
51 IFK<>3THEN53                      :rem 132
52 FORY=D1TOD2STEP22:POKEY,3:POKEY+F,4:NE
   XT:FORY=D3TOD3+10:POKEY,3:POKEY+F,4:NE
   XT                                :rem 64
53 IFK=2THENFORY=D3+2TOD4:POKEY,3:POKEY+F
   ,4:NEXT                           :rem 121
54 IFK<>40THEN57                     :rem 188
55 FORY=D1+43TOD2-23STEP22:POKEY,3:POKEY+
   F,2:NEXT                          :rem 100
56 FORY=D3+2TOD4-2:POKEY,3:POKEY+F,2:NEXT
                                     :rem 97
57 IFK=14THENFORY=GTOHSTEP5:POKEY,3:POKEY
   +F,2:NEXT:POKED4-1,32:POKED2-22,32
                                     :rem 51
58 IFK<>23THEN60                     :rem 187
59 FORY=D1+44TOD2-44STEP22:POKEY,3:POKEY+
   F,2:NEXT:FORY=D3TOD4-2:POKEY,3:POKEY+F
   ,2:NEXT                           :rem 63
```

```
60 IFK>50THENPOKE36879,76:PRINT"{CLR}"
                                        :rem 137
61 POKE36880,5:POKE36881,25:IFK=10ORK=13O
   RK=16ORK=25THENGR=K                  :rem 181
62 IFK<>22THEN65                        :rem 186
63 FORY=D3+2TOD2-44STEP23:POKEY,3:POKEY+F
   ,3:NEXT                              :rem 53
64 FORY=D1+44TOD4-2STEP23:POKEY,3:POKEY+F
   ,3:NEXT                              :rem 54
65 FORY=1TO3:IFTR(Y)=KTHENPOKETA(Y),TB(Y)
   :POKETA(Y)+F,0:NEXT                  :rem 135
66 IFK=15THENFORY=ITOD4-10STEP21:POKEY,3:
   POKEY+F,2:NEXT:FORY=D4-10TOHSTEP23:POK
   EY,3                                 :rem 187
67 IFCU=KTHENCK=9:POKE38399,7:SYS16357
                                        :rem 106
68 IFPEEK(FNC(D))=3THENK=33:GOTO20:rem 65
69 POKE36879,25+INT(RND(.)*7)     :rem 109
70 FORY=4580TO4601:POKEY+F,4:NEXT:IFI(1)=
   9THENPOKE4581,2:O=0                  :rem 189
71 IFI(2)=9THENPOKE4583,5:P=0           :rem 195
72 IFI(3)=9THENPOKE4585,6:Q=0           :rem 201
73 IFI(4)=9THENPOKE4587,7:R=0           :rem 207
74 IFI(5)=9THENPOKE4589,8:S=0           :rem 213
75 IFI(6)=9THENPOKE4591,12:T=0          :rem 252
76 IFI(7)=9THENPOKE4593,12:POKE4593+F,3:U
   =0                                   :rem 15
77 IFI(8)=9THENPOKE4595,19:V=0          :rem 13
78 IFI(10)=9THENPOKE4599,6:POKE4599+F,0:F
   F=0                                  :rem 78
79 IFI(9)=9THENPOKE4597,20:X=0:GOTO220
                                        :rem 19
80 IFI(9)=9THEN82                       :rem 217
81 IFK=37ORK=28ORK=29ORK=8ORK=10ORK=2ORK=
   1THENPOKE38399,0:SYS16357:POKE36879,8
                                        :rem 152
82 POKE36869,205:SYS832:MA=0:MB=0:IFPEEK(
   830)=0THEN241                        :rem 186
83 POKEFNC(D),32:POKE36877,0:IFPEEK(830)=
   1THENMB=-1:IFCK=9THENMB=1             :rem 5
84 IFPEEK(830)=3THENMA=1:IFCK=9THENMA=-1
                                        :rem 204
85 IFPEEK(830)=5THENMB=1:IFCK=9THENMB=-1
                                        :rem 209
86 IFPEEK(830)=7THENMA=-1:IFCK=9THENMA=1
                                        :rem 210
87 A=A+MA:B=B+MB:IFPEEK(FNC(D))=32THEN102
                                        :rem 171
88 GOSUB205:IFPEEK(FNC(D))=3ANDI(1)=0THEN
   244                                  :rem 118
89 IFPEEK(FNC(D))=4ANDI(8)=0THEN244
                                        :rem 46
90 IFPEEK(FNC(D))=7ANDI(4)=0ANDR1<>FNC(D)
   THEN188                              :rem 104
91 POKE36876,INT(RND(.)*127)+128:IFFNC(D)
   =01ANDO=KTHENI(1)=9:O=0              :rem 254
92 IFFNC(D)=P1ANDP=KTHENI(2)=9:P=0:rem 55
93 IFFNC(D)=Q1ANDQ=KTHENI(3)=9:Q=0:rem 60
94 IFFNC(D)=R1ANDR=KTHENI(4)=9:R=0:rem 65
95 IFFNC(D)=S1ANDS=KTHENI(5)=9:S=0:rem 70
96 IFFNC(D)=T1ANDT=KTHENI(6)=9:T=0:rem 75
97 IFFNC(D)=U1ANDU=KTHENI(7)=9:U=0:rem 80
98 IFFNC(D)=X1ANDX=KTHENI(9)=9:X=0:rem 92
99 IFFNC(D)=V1ANDV=KTHENI(8)=9:V=0:rem 86
100 IFFNC(D)=FAANDFF=KTHENI(10)=9:FF=0
                                        :rem 10
101 IFFNC(D)=W1ANDW=KTHENK=INT(RND(.)*40)
   +1:GOTO21                            :rem 26
102 POKE36876,0:IFA>21ORA<0ORB>21ORB<0THE
   N246                                 :rem 195
103 POKEFNC(D),0:POKEFNC(D)+F,0    :rem 45
104 FORY=1TO3:IFE(Y)=KTHEN106           :rem 31
105 NEXT:GOTO112                        :rem 220
106 Y=INT(RND(.)*4)+1:POKEFNA1(D),32:IFE1
   (Y)<ATHENE1(Y)=E1(Y)+1               :rem 137
107 IFE1(Y)>ATHENE1(Y)=E1(Y)-1          :rem 208
108 IFE2(Y)>BTHENE2(Y)=E2(Y)-1          :rem 213
109 IFE2(Y)<BTHENE2(Y)=E2(Y)+1          :rem 210
110 POKEFNA1(D),18:POKEFNA1(D)+F,6
                                        :rem 200
111 IFFNA1(D)=FNC(D)THEN188             :rem 54
112 IFK<>BBTHEN119                      :rem 54
113 MA=0:MB=0:POKEFNA2(D),3:IFBX<ATHENMA=
   1:GOTO117                            :rem 65
114 IFBX>ATHENMA=-1:GOTO117             :rem 162
115 IFBY>BTHENMB=-1                     :rem 154
116 IFBY<BTHENMB=1                      :rem 108
117 BY=BY+MB:BX=BX+MA:IFPEEK(FNA2(D))=4OR
   PEEK(FNA2(D))=7THENBY=BY-MB:BX=BX-MA
                                        :rem 97
118 POKEFNA2(D),13:POKEFNA2(D)+F,2:IFFNA2
   (D)=FNC(D)THEN188                    :rem 167
119 IFK<>CCTHEN126                      :rem 61
120 POKEFNA3(D),32:IFCX<ATHENMA=1:rem 252
121 IFCX>ATHENMA=-1                     :rem 149
122 IFCY>BTHENMB=-1                     :rem 153
123 IFCY<BTHENMB=1                      :rem 107
124 CX=CX+MA:CY=CY+MB:IFPEEK(FNA3(D))=3TH
   ENCX=CX-MA:CY=CY-MB                  :rem 64
125 POKEFNA3(D),14:POKEFNA3(D)+F,0:IFFNA3
   (D)=FNC(D)THEN188                    :rem 167
126 IFK<>DDTHEN133                      :rem 59
127 POKEFNA4(D),32:POKEFNA4(D)-1,32:IFDX<
   ATHENDX=DX+1:GOTO129                 :rem 223
128 DX=DX-1                             :rem 110
129 IFDY<BTHENDY=DY+1:GOTO131           :rem 80
130 DY=DY-1                             :rem 105
131 POKEFNA4(D),17:POKEFNA4(D)-1,16:POKEF
   NA4(D)-1+F,5:POKEFNA4(D)+F,5         :rem 254
132 IFFNA4(D)=FNC(D)THEN188             :rem 60
133 IFK<>EETHEN141                      :rem 58
134 POKEFNA5(D),32:IFEX<ATHENMA=1        :rem 5
135 IFEX>ATHENMA=-1                     :rem 156
136 IFEY>BTHENMB=-1                     :rem 160
137 IFEY<BTHENMB=1                      :rem 114
138 EX=EX+MA:EY=EY+MB                   :rem 57
139 IFPEEK(FNA5(D))=3ORPEEK(FNA5(D))=4ORP
   EEK(FNA5(D))=7THENEX=EX-MA:EY=EY-MB
                                        :rem 210
140 POKEFNA5(D),0:POKEFNA5(D)+F,3:IFFNA5(
   D)=FNC(D)THENZ=INT(RND(.)*10)+1:I(Z)=
   0:EE=0                               :rem 192
141 IFRR=0THEN145                       :rem 255
142 Z=INT(RND(.)*GG)+G:POKEZ,3:POKEZ+F,7:
   IFZ=FNC(D)THEN188                    :rem 76
143 Z=INT(RND(.)*8)+1:POKE36880,Z:Y=INT(R
   ND(.)*9)+21:POKE36881,Y:POKE36876,128
                                        :rem 26
144 POKE36877,128                       :rem 158
145 IFK<>GRORI(4)=9THEN82                :rem 5
146 Z=INT(RND(.)*13)+1:POKEFNA7(D),32:IFG
   H(Z)<ATHENGH(Z)=GH(Z)+1              :rem 18
147 IFGH(Z)>ATHENGH(Z)=GH(Z)-1          :rem 34
148 IFGZ(Z)<BTHENGZ(Z)=GZ(Z)+1          :rem 86
149 IFGZ(Z)>BTHENGZ(Z)=GZ(Z)-1          :rem 91
150 POKEFNA7(D),0:POKEFNA7(D)+F,2:IFFNA7(
   D)=FNC(D)THEN188                     :rem 126
151 GOTO82                              :rem 58
152 PRINT"{YEL}{CLR}{6 RIGHT}{RVS}THE SWO
   RD{2 DOWN}"                          :rem 236
153 PRINT"{WHT}PRESS F1 TO START IN
   {6 SPACES}THE FOREST.{2 DOWN}":rem 63
```

```
154 PRINT"PRESS F3 TO BE PLACED{3 SPACES}
    RANDOMLY IN A ROOM.{2 DOWN}"  :rem 15
155 PRINT"PRESS F5 TO START WITH
    {3 SPACES}A TREASURE.{2 DOWN}"
                                  :rem 221
156 GETT$:IFT$=""THEN156          :rem 129
157 IFT$="{F1}"THENK=33:M=4:GOTO4 :rem 102
158 IFT$<>"{F3}"THEN161           :rem 176
159 GOSUB15:IFY=8ORY=10ORY=12ORY=30ORY=40
    THEN159                       :rem 81
160 K=Y:M=4:GOTO4                 :rem 23
161 IFT$="{F5}"THEN163            :rem 112
162 GOTO152                       :rem 106
163 PRINT"{CLR}{3 SPACES}TREASURES
    {3 DOWN}":PRINT"0. RANDOM"    :rem 25
164 PRINT"1. BOOTS":PRINT"2. WAND OF SECR
    ETS":PRINT"3. GLOBE":PRINT"4. CROSS"
                                  :rem 97
165 PRINT"5. WAND OF THE WAY":PRINT"6. PU
    RPLE KEY":PRINT"7. BLUE KEY"  :rem 18
166 PRINT"8. AXE":PRINT"9. TORCH":rem 164
167 GETT$:IFT$=""THEN167          :rem 133
168 IFT$<"0"ORT$>"9"THEN152       :rem 241
169 HH=VAL(T$):IFHH=0THENHH=INT(RND(.)*9)
    +1                            :rem 57
170 I(HH)=9:GOTO152               :rem 67
171 GOSUB15:N=Y:IFN=1ORN=7ORN=6ORN=9ORN>1
    3ANDN<21ORN>22ANDN<30ORN>30THEN171
                                  :rem 70
172 GOSUB15:O=Y:IFO=1ORO=9ORO=17ORO>24AND
    O<28ORO>32ANDO<38THEN172      :rem 161
173 GOSUB15:P=Y:IFP=10ORP=8ORP=28ORP=29TH
    EN173                         :rem 185
174 GOSUB15:Q=Y:IFQ=1ORQ=9ORQ=17ORQ>24AND
    Q<28ORQ>32ANDQ<38THEN174      :rem 181
175 GOSUB15:R=Y:GOSUB15:S=Y:GOSUB15:X=Y:G
    OSUB15:W=Y                    :rem 119
176 GOSUB15:T=Y:IFT>1ANDT<6ORT>10ANDT<14T
    HEN176                        :rem 246
177 GOSUB15:V=Y:IFV=1ORV=9ORV=17ORV>24AND
    V<28ORV>32ANDV<38THEN177      :rem 227
178 GOSUB15:U=Y:IFU>1ANDU<6ORU>10ANDU<14O
    RU=21ORU=22ORU=30THEN178      :rem 194
179 GOSUB15:FF=Y:IFY=1ORY=2ORY=10ORY=8ORY
    =37ORY=28ORY=29THEN179        :rem 151
180 FORZ=1TO3:AA(Z)=INT(RND(.)*GG)+G:NEXT
                                  :rem 4
181 FORZ=1TO3:GOSUB15:TR(Z)=Y:GOSUB14:TA(
    Z)=Y:NEXT:TB(1)=6:TB(2)=19:TB(3)=2
                                  :rem 138
182 DIMGZ(13):DIMGH(13):FORZ=1TO13:GOSUB1
    6:GZ(Z)=Y:GH(Z)=Y:NEXT:RETURN:rem 237
183 IFK=10ORK=8THENPOKED3,42      :rem 220
184 IFK=9ORK=7THENPOKED4,42       :rem 181
185 IFK=24ORK=28ORK=37THENPOKED2,42
                                  :rem 167
186 IFK=16ORK=20ORK=29THENPOKED1,42
                                  :rem 161
187 GOTO38                        :rem 68
188 M=M-1:FORY=250TO200STEP-1:FORZ=230TO2
    40                            :rem 121
189 POKE36877,Y:POKE36876,Z:NEXT:NEXT:IFM
    <1THEN192                     :rem 162
190 POKE36877,0:POKE36876,0:K=33:GOSUB15:
    BB=Y:GOSUB15                  :rem 195
191 CC=Y:GOSUB15:DD=Y:GOSUB15:K=Y:CK=0:GO
    TO20                          :rem 116
192 POKE36876,0:POKE36877,0       :rem 9
193 PRINT"{CLR}{RED}{2 RIGHT}{6 DOWN}YOUR
     QUEST IS OVER":POKE36869,192:POKE368
    79,8                          :rem 149
194 PRINT:IFM<1THENPRINT"{2 DOWN}
    {3 RIGHT}YOU HAVE FAILED{6 SPACES}
    {DOWN}TO FIND THE SWORD"      :rem 50
195 IFM>0THENPRINT:PRINT"{2 RIGHT}{WHT}
    {RIGHT}CONGRATULATIONS!{4 SPACES}
    {DOWN}{RIGHT}YOU FOUND THE SWORD"
                                  :rem 193
196 PRINT"{6 RIGHT}{2 DOWN}PRESS FIRE"
                                  :rem 244
197 SYS832:IFPEEK(831)=0THEN197   :rem 85
198 RUN                           :rem 151
199 RETURN                        :rem 131
200 IFFNC(D)<>N1THEN188           :rem 86
201 FORY=160TO255:POKE36876,Y:FORZ=14TO0S
    TEP-2:POKE36878,Z:NEXT:NEXT:D8=36878
                                  :rem 97
202 GOTO203                       :rem 98
203 FORY=255TO160STEP-1:POKE36876,Y:FORZ=
    0TO14STEP2:POKED8,Z:NEXT:FORZ=14TO0ST
    EP-4                          :rem 77
204 POKED8,Z:NEXT:NEXT:GOTO192    :rem 200
205 IFPEEK(FNC(D))=63ORPEEK(FNC(D))=1THEN
    200                           :rem 96
206 IFPEEK(FNC(D))<>10THENRETURN  :rem 243
207 Z=INT(RND(.)*10)+1            :rem 182
208 I(Z)=9:K=80:LK=1:RETURN       :rem 135
209 IFI(3)=9THEN216               :rem 53
210 IFI(10)=9THEN212              :rem 87
211 RETURN                        :rem 116
212 IFK-N=8ORK-N=-8ORK-N=1ORK-N=-1THENPOK
    E36876,130:GOTO215            :rem 118
213 IFK-N=7ORK-N=9ORK-N=-7ORK-N=-9THENPOK
    E36876,250:GOTO215            :rem 136
214 POKE36876,200                 :rem 146
215 RETURN                        :rem 120
216 IFK-N=8ORK-N=-8ORK-N=1ORK-N=-1THENPOK
    E36876,250:GOTO219            :rem 129
217 IFK-N=7ORK-N=9ORK-N=-7ORK-N=-9THENPOK
    E36876,200:GOTO219            :rem 139
218 POKE36876,130                 :rem 152
219 RETURN                        :rem 124
220 IFK=OTHENPOKEO1,2:POKEO1+F,0:IFI(5)=9
    THENPOKEO1+F,7                :rem 172
221 IFK=PTHENPOKEP1,5:POKEP1+F,0  :rem 243
222 IFK=QTHENPOKEQ1,6:POKEQ1+F,0:IFI(5)=9
    THENPOKEQ1+F,7                :rem 186
223 IFK=RTHENPOKER1,7:POKER1+F,0:IFI(5)=9
    THENPOKER1+F,7                :rem 192
224 IFK=STHENPOKES1,8:POKES1+F,0   :rem 2
225 IFK=TTHENPOKET1,12:POKET1+F,4  :rem 53
226 IFK=UTHENPOKEU1,12:POKEU1+F,3  :rem 56
227 IFK=FFTHENPOKEFA,6:POKEFA+F,0  :rem 66
228 IFK=WTHENPOKEW1,15:POKEW1+F,2  :rem 66
229 IFK=VTHENPOKEV1,19:POKEV1+F,0:IFI(5)=
    9THENPOKEV1+F,7                :rem 9
230 IFK=XTHENPOKEX1,20:POKEX1+F,7  :rem 63
231 IFK<>NTHEN80                  :rem 207
232 POKEN1,63:POKEN1+F,0:FORY=1TO3:POKEAA
    (Y),63:POKEAA(Y)+F,0:NEXT:IFI(5)=9THE
    NPOKEN1,1                     :rem 154
233 GOTO80                        :rem 57
234 DATA169,148,133,252,169,1,133,251,173
    ,255,149,160,0,145,251,200,208,251,16
    0,255,145                     :rem 239
235 DATA251,230,251,208,250,96    :rem 245
236 DATA120,8,72,152,72,138,72,173,19,145
    ,72,173,34,145,72,169,0,141,62,3,141,
    63,3,169                      :rem 195
237 DATA127,141,34,145,173,32,145,73,255,
    41,128,42,8,169,195,141,19,145,173,17
    ,145,73                       :rem 161
```

```
238 DATA255,41,60,74,74,40,42,168,41,16,2
    01,16,208,3,141,63,3,152,41,15,162,0,
    232,224,9                          :rem 214
239 DATA240,8,221,160,3,208,246,142,62,3,
    104,141,34,145,104,141,19,145,104,170
    ,104,168                           :rem 165
240 DATA104,40,88,96,2,3,1,5,4,12,8,10
                                       :rem 103
241 IFPEEK(831)=16ANDI(4)=0THENM=0:GOTO18
    8                                  :rem 231
242 IFPEEK(831)=16THENI(4)=0:BB=50:CC=50:
    DD=50:FORY=1TO3:E(Y)=50:NEXT       :rem 111
243 GOTO103                            :rem 102
244 IFA>21ORA<0ORB>22ORB<0THEN246      :rem 248
245 A=A-MA:B=B-MB:GOTO102              :rem 210
246 IFA>21THENA=0:K=K+1:IFK=41THENK=1
                                       :rem 241
247 IFA<0THENA=21:K=K-1:IFK=0ORK=32ORK=24
    ORK=16ORK=8THENK=33                :rem 0
248 IFB>21THENB=0:K=K-8:IFK<1THENK=34
                                       :rem 255
249 IFB<0THENB=21:K=K+8:IFK>40THENK=35
                                       :rem 50
250 IFTI$>"000200"THEN252             :rem 83
251 GOSUB209:GOTO20                    :rem 136
252 FORY=1TO3:IFE(Y)<KTHENE(Y)=E(Y)+1
                                       :rem 2
253 IFE(Y)>KTHENE(Y)=E(Y)-1            :rem 73
254 NEXT:IFCC<KTHENCC=CC+8             :rem 139
255 IFCC>KTHENCC=CC-8                  :rem 23
256 IFBB>KTHENBB=BB-7                  :rem 17
257 IFBB<KTHENBB=BB+7                  :rem 14
258 IFDD>KTHENDD=DD-9                  :rem 33
259 TI$="000000":IFDD<KTHENDD=DD-9
                                       :rem 188
260 GOTO251                            :rem 105
261 IFK=3THEN22                        :rem 118
262 FORY=1TOINT(RND(.)*50)+50:Z=INT(RND(.
    )*GG)+G:POKEZ,4:POKEZ+F,5:NEXT:GOTO22
                                       :rem 75
263 IFOM=MTHEN266                      :rem 29
264 POKE36879,8                        :rem 64
265 POKE36869,192:PRINT"{CLR}{7 DOWN}
    {6 RIGHT}MEN LEFT";M:FORT5=1TO1000:NE
    XT:POKE36869,205:K=33              :rem 83
266 OM=M:RETURN                        :rem 222
```

Bug-Swatter:

Modifications And Corrections

• In line 60 of "Address File" (February), the GOSUB should be changed to GOTO. Otherwise, the return addresses build up on the stack, eventually causing an out of memory error.

• "Free VIC" from Machine Language For Beginners (April) may not work correctly, because the VIC has 22 columns and the program tries to print at column 30. Make the following change:

```
858 DATA 3,160,16,162,0,24
```

• There are no known corrections for "Auto Line" (December 1984). However, the article incorrectly described a method for loading Automatic Proofreader from Auto Line. If you load a longer program from a shorter one, the pointer to variables is not updated. To use the programs together, load and run Auto Line. Next, from immediate mode, load and run Automatic Proofreader.

• Many readers have suggested that "Magazine Indexer" (January) and "Address File" (February) would be more useful with a printer option. The following program will read addresses from disk and print them on a Commodore printer. Note that this is a separate program, and should not be added to Address File.

```
10 OPEN2,8,2,"0:ADDRESSES,S,R":OPEN4,4:B=
   6
20 INPUT#2,A
30 FORJ=1TOA:FORK=1TOB
40 INPUT#2,A$:PRINT#4,A$;:PRINT#4,"
   {3 SPACES}";
50 NEXTK:PRINT#4:NEXTJ
60 CLOSE2:PRINT#4:CLOSE4
```

For Magazine Indexer files, change the filename in line 10 to "0:ARTICLES,S,R" and change B=6 to B=1. For both programs, tape users should change the first statement in line 10 to OPEN2,1,0,*"filename"*.

• If you own more than one disk drive, you may have found that "Disk Auto Load" (November 1984) works only with drive number eight. Reader Andrew W. Gaunt suggests the following changes:

```
687 DATA3,3,165,186,170,160,0,32   :rem 88
7280 DATA162,200,160,29,32,189,255,165
                                   :rem 139
7288 DATA186,170,160,255,32,186,255,169
                                   :rem 209
```

Also, the checksums should be changed in line 25 (from 8554 to 8728) and 45 (from 42577 to 42751). With these modifications, the program loads and runs from the disk drive containing the boot program.

• All versions of "Forbidden Crypt" (February) work as listed. The 64 version, however, does not clear the variable TC between games. When a game ends and a new one begins, you may not have to gather treasure from all four rooms of level one. If you consider this a bonus, it does no harm to leave it in the game. Or, change line 612, adding a colon and TC=0 after the WAIT198,1.

NEWS & PRODUCTS

PROMAL

SMA has developed a new structured programming language called PROMAL. Designed for programmers of all levels, PROMAL includes a one-pass compiler, a full screen editor, and a library of predefined utility subroutines. It also has a runtime environment which enables applications to be written in a high-level language. The operating system provides file, memory and program management, and I/O redirection. The suggested price is $49.95.

SMA, 3700 Computer Dr., P.O. Box 20025, Raleigh, NC 27619.

Circle Reader Service Number 230.

Modem, Disk Drive For Commodore

Cardco has released the MOD-1 modem, a full auto-answer/auto-dial modem that can be used in place of the Commodore 1650. The MOD-1 comes with a terminal software package, on disk, which enables full uploading and downloading of text and program files. A simple word processor and several utility programs which will allow conversion to and from ASCII are also on the disk. Suggested retail is $69.95.

Among other new releases from Cardco is the CSD-1 disk drive, which obeys all standard Commodore DOS commands, and can be used in place of the Commodore 1541. Suggested retail is $349.95. Cardco has also released *Calc Now!/64*, a spreadsheet package for the Commodore 64 with 39K of free memory for data. Featured are onscreen "help" window displays for assistance, individually variable column widths, a built-in scratch pad calculator, and a keyboard overlay.

Among the mathematical functions supported by *Calc Now!* are logical AND, logical OR, logical NOT, log base 10, total range of cells, average range of cells, number of nonblank cells in a range, and several more. *Calc Now!* retails for $39.95 on disk only.

Cardco, Inc., 300 S. Topeka, Wichita, KS 67202.

Circle Reader Service Number 231.

Music System For Commodore 64

With *Music Port*, a new keyboard and software system from Tech Sketch, users can create their own accompaniment, double-track, and playback and store original music. Also included in the software are special effects, such as vibrato and reverberation, as well as numerous preset sounds and sequences. The keyboard is full size, with a three-octave range.

Music Port, for the Commodore 64 with a disk drive, retails for $149.

Tech Sketch, Inc., 26 Just Rd., Fairfield, NJ 07006.

Circle Reader Service Number 232.

Electronic Typewriter, Printer

The new Juki 2000 electronic typewriter features 16-character correction memory, 10 and 12 pitch selection, and automatic underline and centering. Suggested price is $299.

Also new from Juki is the Juki 6000 printer, a letter-quality daisywheel printer with 2K internal memory and 10, 12, and 15 pitch selections. Suggested price is $299.

Juki Office Machine Corp., 1261 Wiley Road, Suite B, Schaumburg, IL 60195.

Circle Reader Service Number 233.

New Adventure Games

Windham Classics, a division of Spinnaker Software, has a new line of graphics and text adventure games based on literary classics. Available titles in the series are *Swiss Family Robinson*, in which the player assumes the role of Fritz, and *Below the Root*, a quest for the secret of Green Sky. New titles include *Treasure Island* and *Alice's Adventures in Wonderland.*

The games are designed for ages ten to adult, and are currently available for the Commodore 64 with a disk drive, for $26.95.

Windham Classics, One Kendall Square, Cambridge, MA 02139.

Circle Reader Service Number 234.

Database, Telecommunications For 64

A new database management system, called *YES, A Database*, has been released from Orbyte Software. The system allows user-designed record and print formats with special repeat fields, memo files with text-editing and calculating abilities, and a batch processing option. Special calculations files have the capacity for up to 40 mathematical formulas each. Suggested retail is $79.95.

Orbyte has also introduced *Hotline Communications*, a telecommunications program for the Commodore 64. The program enables direct communication from one Commodore to another, and accesses most databases, including Dow Jones, MCI Mail, and The Source. It also features a bulletin board for posting and saving on-screen messages. *Hotline Communications* sells for $79.95.

Orbyte Software, P.O. Box 948, Waterbury, CT 06720.

Circle Reader Service Number 235.

Memory And Study Aid

Remember, a new program from DesignWare, helps users learn and remember facts, sequences, relationships, and lists. Developed in collaboration with an expert on human memory at the University of California at Berkeley, *Remember* employs a variety of techniques to help students retain their study material. Three learning modes are included: Familiarization, Practice and Test. *Remember* retails for $79.95,

and is available on disk for the Commodore 64.

Also new from DesignWare are two learning games. *European Nations & Locations* is a trivia game about European history and geography; *The Body Transparent* is an anatomy game in which the player gains points by moving bones and organs to their correct locations. Each program is available on disk for $44.95, for the Commodore 64.

DesignWare, 185 Berry Street, San Francisco, CA 94107.

Circle Reader Service Number 236.

Remote Tuner

The ET-001, a new tuner from the Kette Group, can convert a color monitor into a remote-control, high-resolution television receiver. Because a color monitor has better resolution than a normal color television, this allows better clarity of color and picture definition. The remote control can be preset to 12 channels and features automatic fine tuning.

Suggested retail is $79.95.

The Kette Group, Inc., 13895 Industrial Park Blvd., Minneapolis, MN 55441.

Circle Reader Service Number 237.

The Print Shop For Commodore

Brøderbund has released a Commodore 64 version of *The Print Shop*, its popular graphics program. The program can be used to write, design, and print greeting cards, stationery, letterhead, signs, and banners. Eight different typestyles and dozens of pictures and symbols are available. A built-in graphics editor lets the user create original pictures and symbols or modify those already provided. The program is available on disk for $44.95.

Brøderbund Software, 17 Paul Dr., San Rafael, CA 94903.

Circle Reader Service Number 238.

Space Action Games

Marauding aliens and numerous blockades are the obstacles en route to the Orion empire in *Oisac*, a new arcade-style game from Handic Software. A fast-paced shoot-em-up game, *Oisac* features multiple play levels and requires a joystick. Suggested price, on disk, is $19.95.

Handic Software, Inc., 520 Havens Cove Rd., Bricktown, NJ 08723.

Circle Reader Service Number 239.

Quest For Tires Sequel

Sierra has announced the release of *Grog's Revenge*, a sequel to the popular *B.C.'s Quest for Tires* based on the comic strip *B.C.* The new game features Thor, the first man, on a quest for the meaning of life. The challenge is to steer Thor over a clam-scattered mountain path while watching for Tiredactals and the Neanderthal named Grog.

Grog's Revenge is available on disk for the 64 for $34.95.

Sierra, Inc., Coarsegold, CA 93614.

Circle Reader Service Number 240.

Weather, Whitehouse, War

Tornado Tom, a new game from Nanosec, teaches children the basics of meteorology. Up to four players compete to predict the weather the most accurately. Pressure zones, cold and warm fronts, and weather maps are illustrated on the screen. Suggested retail, on disk, is $39.95.

Also from Nanosec is *The Whitehouse Blues*, an arcade-style simulation of the American presidency; and *Alpha-Omega Run*, a battle to defend your planet against an evil overlord in the year 3012. Each program is available on disk for the Commodore 64; *Whitehouse* sells for $34.95; *Alpha-Omega*, for $39.95.

Nanosec Corporation, 3544 Lincoln Ave., Ogden, UT 84401

Circle Reader Service Number 241.

Graphics Printing Program

HardCopy, from FSI Software, is an image transfer utility which will print screen images on dot-matrix printers. High-resolution and multicolor graphics are printed in shades of gray. For the Commodore 64, *HardCopy* is compatible with *Koala-Pad*, *Doodle*, *Simon's BASIC* and other graphics programs. Suggested retail is $29.95, on disk.

Another recent release from FSI Software is *ApSoft-64*, an Applesoft emulator for the 64. The program adds commands to the 64's BASIC in the Applesoft format, including high-resolution graphics and custom character creation commands. Purchasers of *ApSoft-64* will receive a free copy of the database management program *File Cabinet*. Suggested price is $39.95.

FSI Software, P.O. Box 7096, Minneapolis, MN 55407.

Circle Reader Service Number 242.

Arcade Adventure

In *Chopper Hunt*, Imagic's new release, the player pilots a powerful helicopter and blasts through the earth to recover objects buried in a nuclear dump site. Meanwhile, hovering aircraft fill in excavations as quickly as they are blasted. On disk for the Commodore 64; suggested retail is $19.95.

Imagic, 981 University Ave., Los Gatos, CA 95030.

Circle Reader Service Number 243.

New Product releases are selected from submissions for reasons of timeliness, uniqueness, available space, and general interest. Readers should be aware that News & Products often contains an edited version of material submitted by vendors. We are unable to vouch for its accuracy at time of publication.

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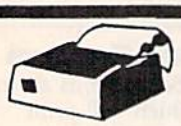

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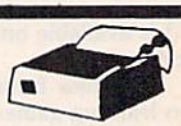

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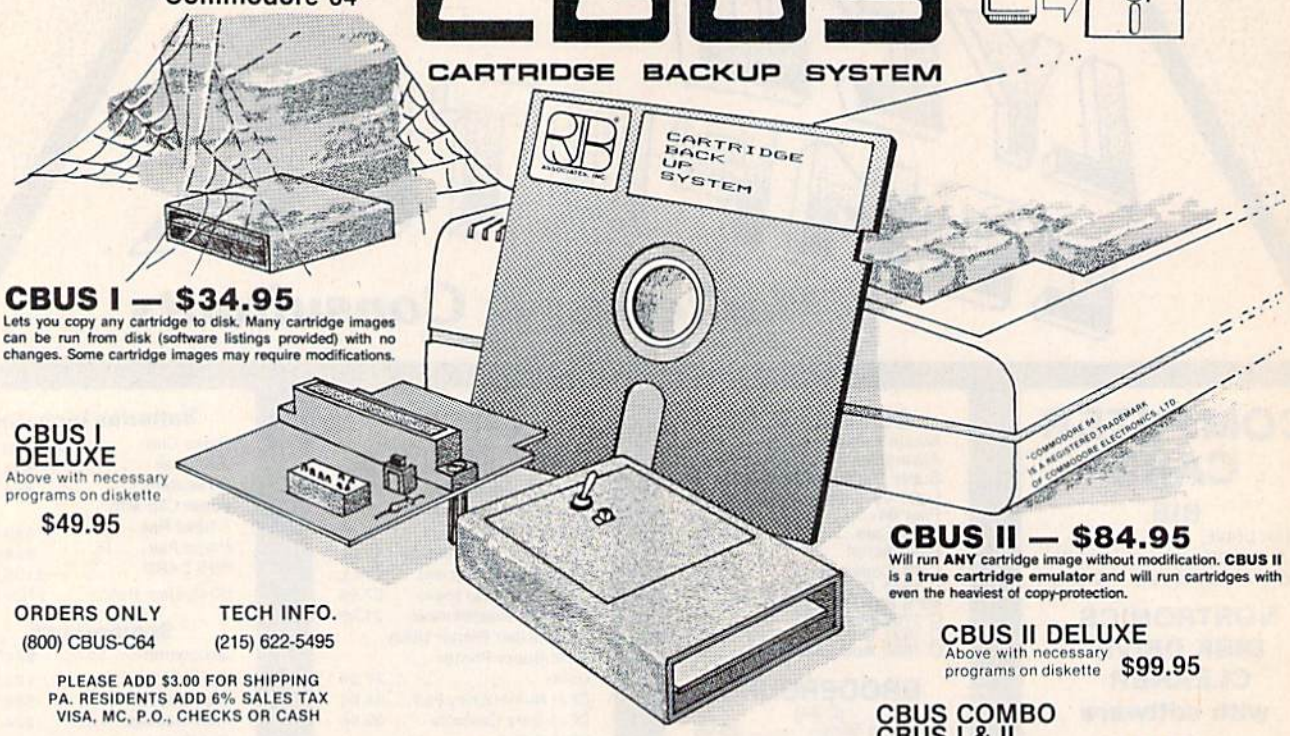

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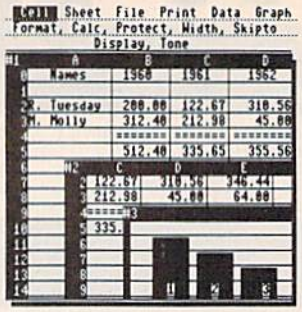

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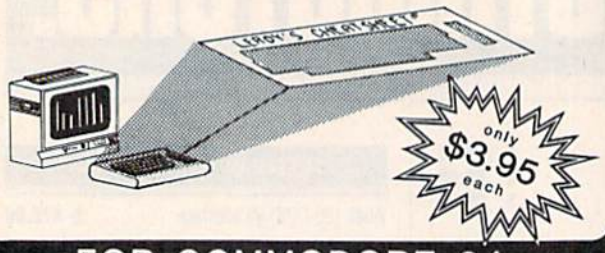

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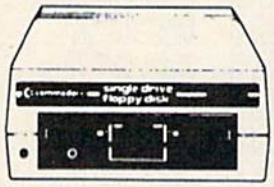

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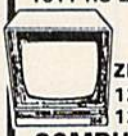

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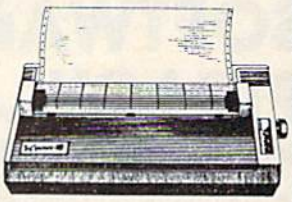

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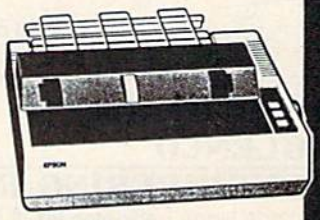

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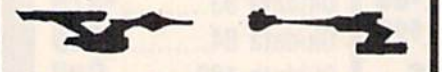

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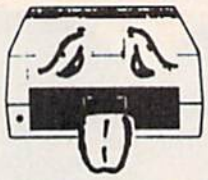

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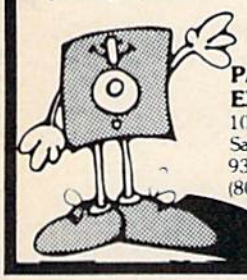

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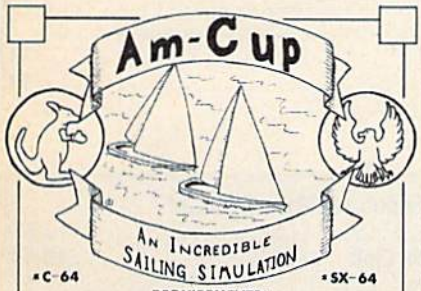

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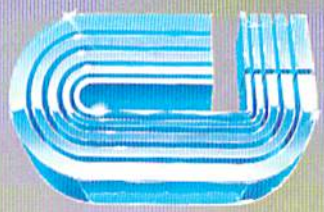

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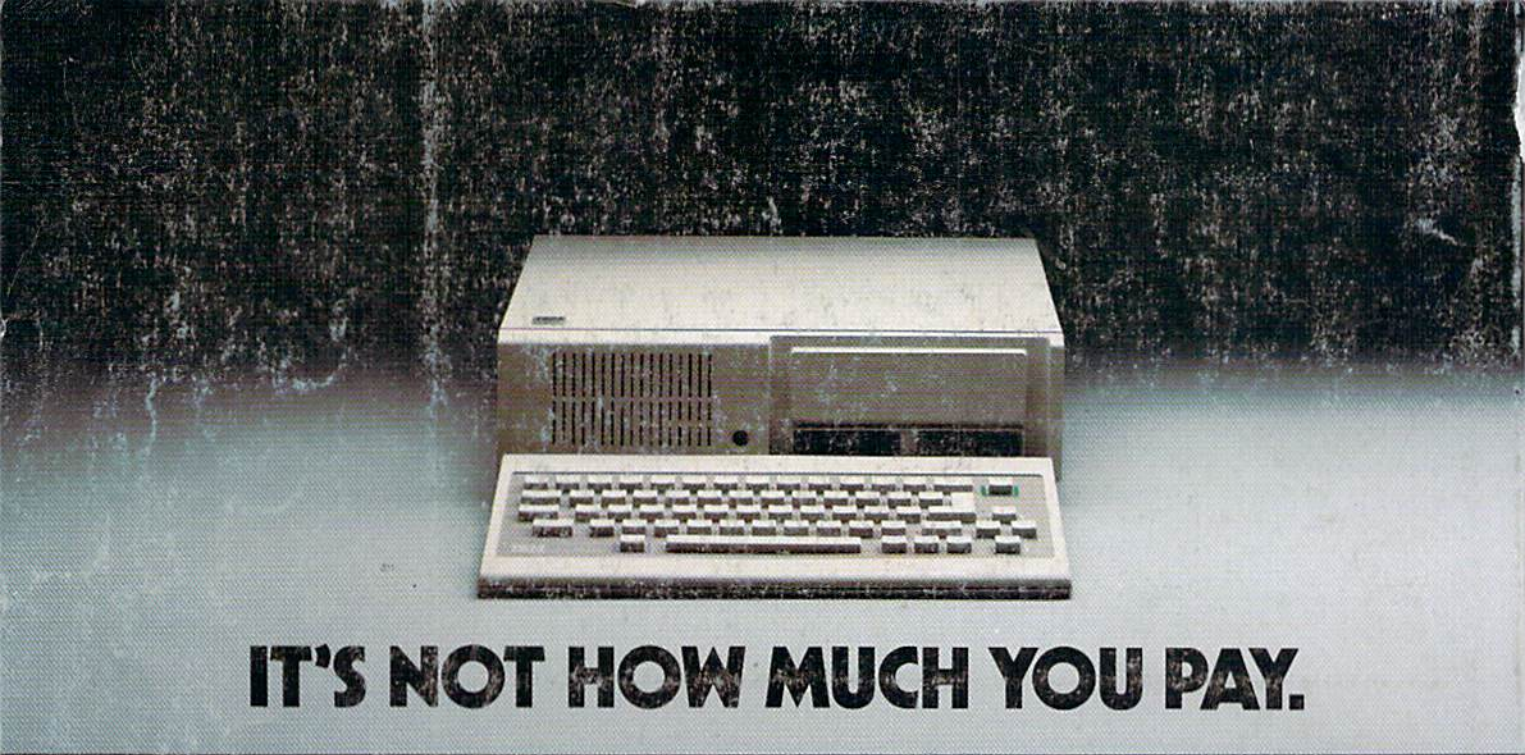

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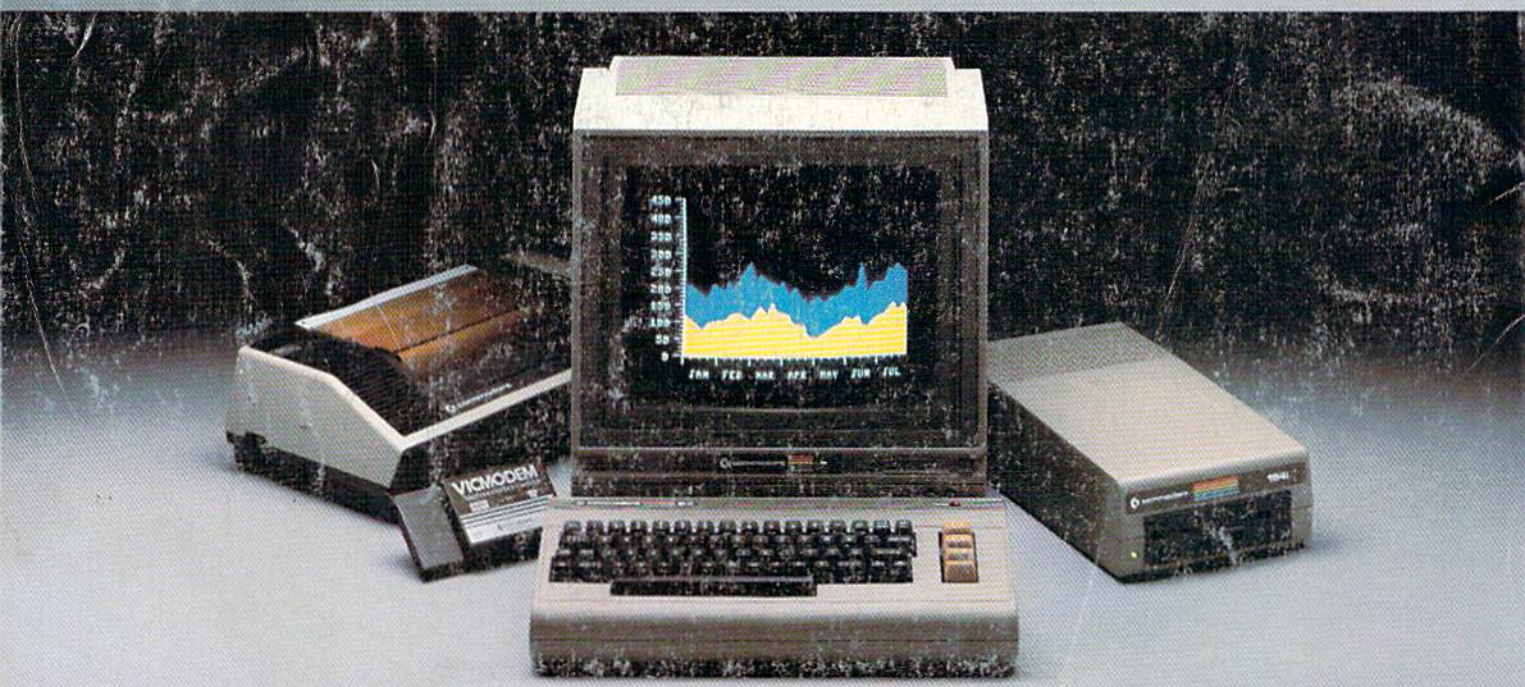

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